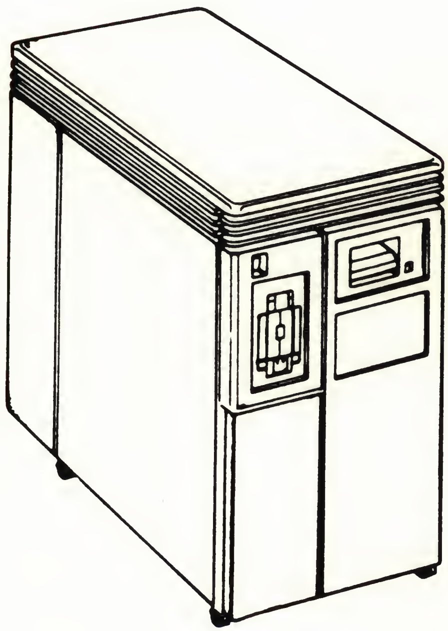
AZ-FE09A-TN

MicroVAX II 630QB

TECHNICAL MANUAL



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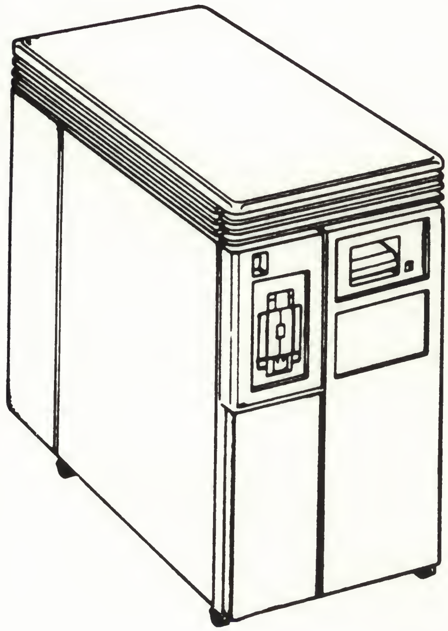

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First Printing, **April** 1985

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)

TABLE OF CONTENTS (CONT'D)

Chapter 6 - FRU REMOVAL AND REPLACEMENT PROCEDURES

LIST OF FIGURES

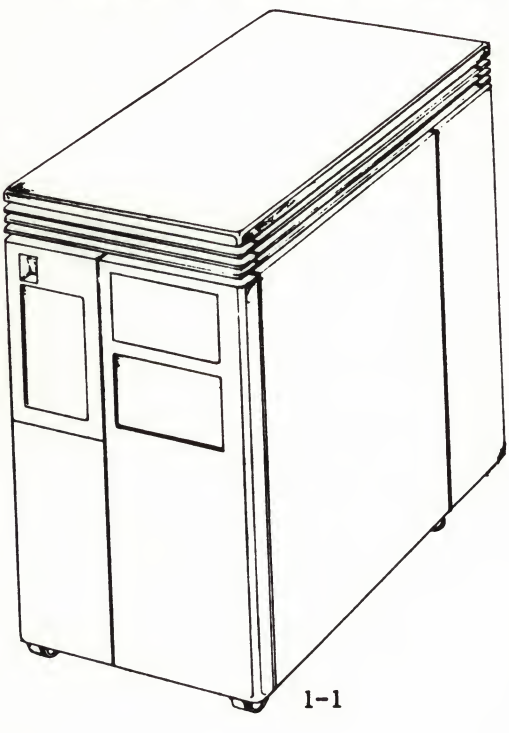
CHAPTER 1 - BA123-A ENCLOSURE

1.1 Introduction

The BA123-A enclosure (Figure 1-1) is a floorstanding unit for microcomputer systems. It can support a wide variety of hardware options. The enclosure is air-cooled and designed to operate in an open office environment. It includes the following major components:

1. Enclosure frame
2. Control panel
3. Mass-storage area
4. Backplane assembly
5. Power supply
6. Input/Output (I/O) distribution panel

Figure 1-1 BA123-A Enclosure



1.2 Enclosure Frame

The BA123-A enclosure frame houses the power supply and the backplane assembly. It also provides mounting space for five 13.3 cm (5.25 in) mass-storage devices. It is mounted on four shock-isolating castors and has the following dimensions:

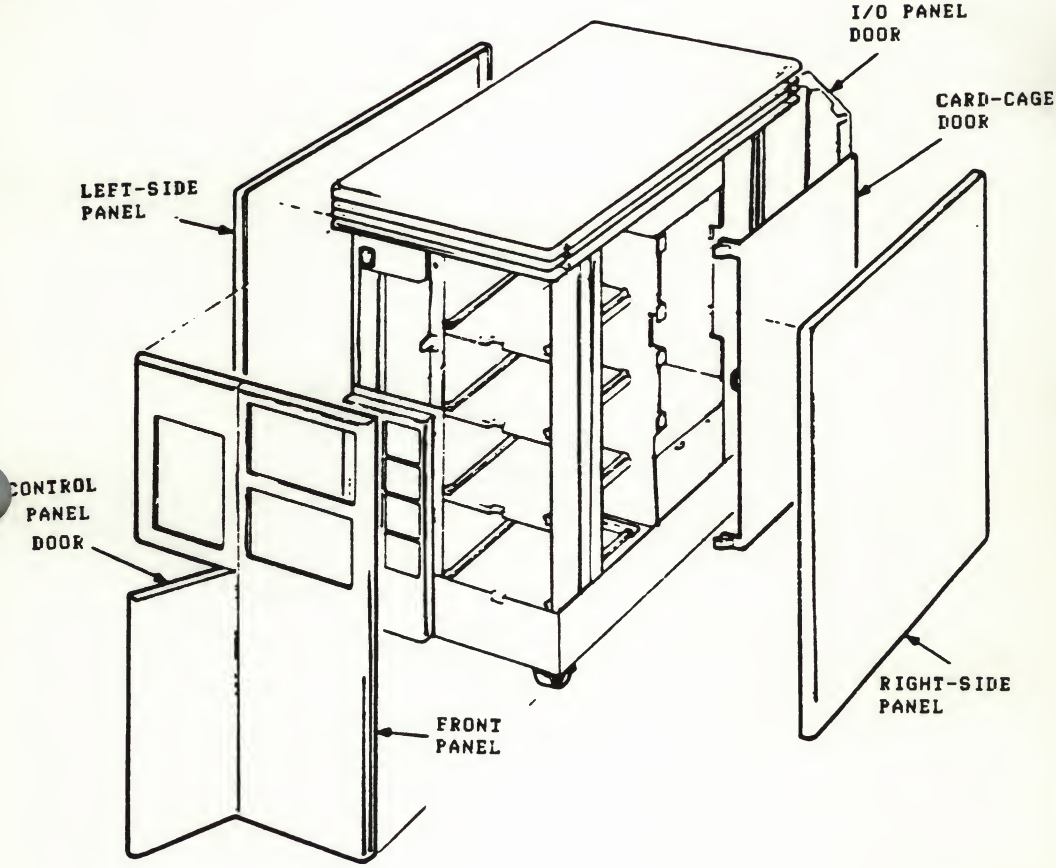
Height: 62.2 cm (24.5 in)
Width: 33.0 cm (13.0 in)
Depth: 70.0 cm (27.5 in)

The enclosure frame is covered by removable panels on the front, right, and left sides (Figure 1-2):

There are three doors: a control panel door on the front, an I/O panel door at the rear, and a card-cage door inside the right side panel.

NOTE
For panel removal procedures see section 6.2.

Figure 1-2 BA123-A Removable Panels and Doors

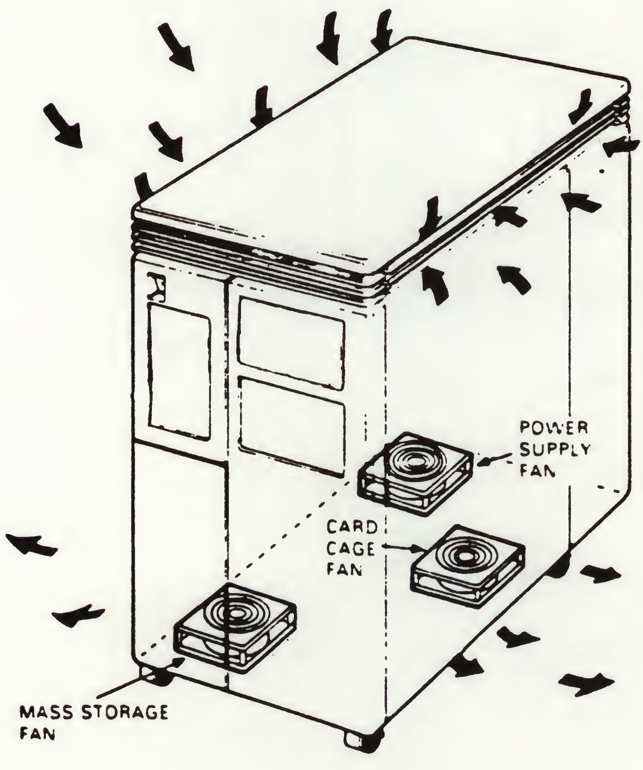


1.2.1 Air Circulation

Three fans in the BA123-A enclosure draw air in from the top of the enclosure as follows:

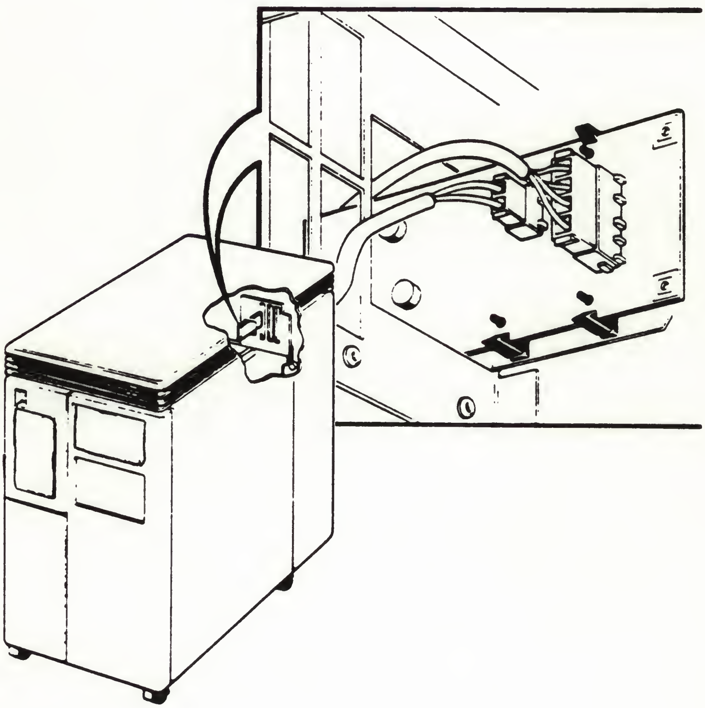
Below the module card-cage
Behind the control panel
Inside the power supply (Figure 1-3).

Figure 1-3 Air Flow



A printed circuit (PC) board above the card-cage contains two temperature sensors (Figure 1-4). One sensor regulates the speed of the card-cage fan, at the minimum level required to maintain a constant temperature within the card-cage. The other sensor shuts down the system at high temperature. The card-cage door encloses the area surrounding the modules. Removal of this door triggers an interlock switch, which increases the speed of the card-cage fan to maximum. If the proper temperature within the card-cage cannot be maintained, even at maximum fan speed, the over-temperature sensor will cause the system to shut down. The system also shuts down if the card-cage fan fails.

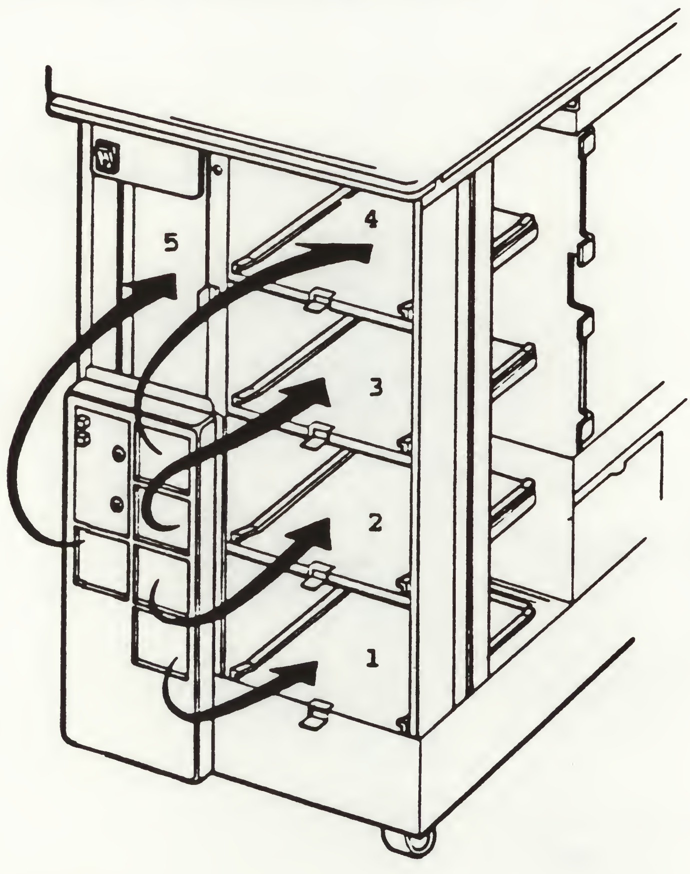
Figure 1-4 Temperature Sensor PC Board



1.3 Control Panel

The control panel has six cutouts to provide space for control circuits. One cutout is used for a CPU console board. The other five cutouts provide space for mass-storage console boards. Unused cutouts are covered with removable plates. Figure 1-5 shows the relation between the cutouts and the mass-storage shelves.

Figure 1-5 Mass-Storage Shelves



1.3.1 CPU Console Board

The CPU console board (Figure 1-6) is attached to the back of the control panel. It contains a DCOK indicator light, and two buttons that allow the user to halt or restart the system. A ribbon cable connects the CPU console board to the backplane. This cable provides the connection between the CPU and the CPU console board. The buttons provide the following functions:

* When the HALT button is depressed, the red LED in the HALT button will light. If halts are enabled by the switch on the CPU distribution panel at the rear of the system (section 2.2.3), the system will enter 'Console I/O Mode' when the HALT button is depressed (section 2.2.1).

  NOTE

  If halts are disabled at the rear of the system, the LED in the HALT button will still light when the button is depressed, but the system will not be halted.

* When the DCOK light is ON, the system is receiving stable DC voltage from the power supply.

* When the restart button is depressed, the system will boot.

There are two LEDs on the CPU console board. These can be seen by removing the left side panel of the enclosure. If the DCOK light on the control panel is not lit, these two LEDs will indicate which regulator supply to the backplane has failed.

Regulator A = left LED
Regulator B = right LED

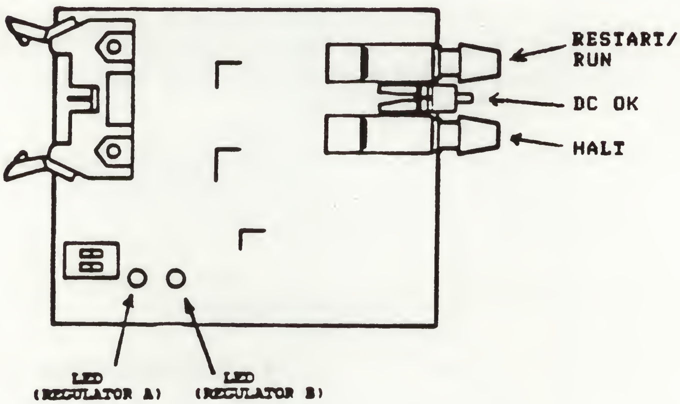
LED is ON = +5vdc to the backplane is OK
LED is OFF = regulator or connection to regulator has failed

NOTE

There should be at least one module in both odd and even-numbered backplane slots to draw enough current to start each regulator. See section 1.8.

There is a DIP switch to the left of the LEDs that contains two switches. Both switches are normally OFF and are unused in MicroVAX systems.

Figure 1-6 CPU Console Board



1.4 Mass-Storage Shelves

The front panel covers shelves used for mounting up to five 13.3 cm (5.25 in) mass-storage devices (Figure 1-5). Removable plates in front of shelves 3, 4 and 5 allow access to removable-media devices. Devices occupy the five shelves as follows:

Diskette drive	Tape drive
	Disk Drive 3
	Disk Drive 2
	Disk Drive 1

1.4.1 Signal Distribution Board

The signal distribution board (M9058, Figure 1-7) is mounted in the bottom two (C and D) rows of backplane slot 13.

Up to four fixed-disk drives, or an RX50 diskette drive and up to two fixed-disk drives can be connected to the signal distribution board (Figure 1-8). The signal distribution board is connected by a 50-conductor ribbon cable to an RQDX2 mass-storage controller module (M8639-YB) in the card-cage. A ribbon cable is also connected between the signal distribution board and the RD console boards behind the control panel.

Figure 1-7 Signal Distribution Board

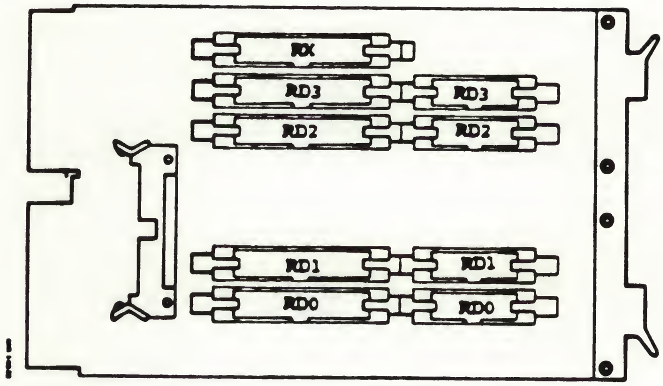


Figure 1-8 Signal Distribution Board Cabling

SEE FIGURE 6-1

1.5 Backplane

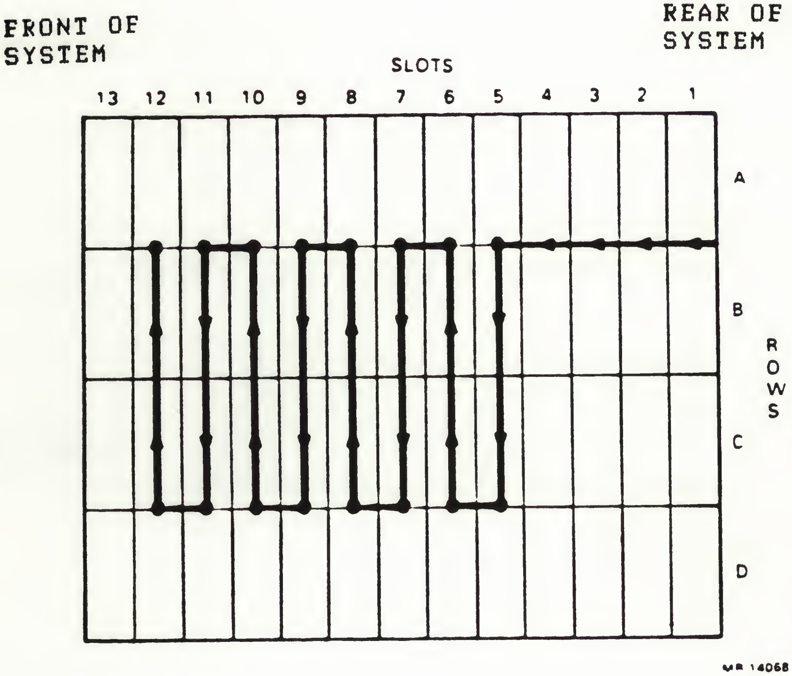
The BA123 has a four row by thirteen slot backplane that measures 27.9 X 19.9 cm (11 in x 7.85 in). The backplane implements the extended LSI-11 bus (or Q22-bus), which uses 22-bit addressing.

The first twelve slots of the backplane provide space for dual or quad-height modules that are compatible with the Q22-bus.

> A dual-height module has connectors that fit into two rows of a backplane slot. Two dual-height modules can occupy one backplane slot.
>
> **NOTE**
>
> Dual-height modules in slots 5 - 11 and rows C and D of slot 12 require another dual-height module or an M9047 grant card the in the other two rows of the slot.
>
> A quad-height module has connectors that fit into all four rows of a backplane slot. One quad-height module occupies one backplane slot.

Figure 1-9 shows the grant lines for the Q22-bus interrupt and for direct memory access (DMA). The C and D rows of slots 1 - 4 implement a separate MicroVAX II local memory interconnect that is used to interface the system CPU and memory modules.

Figure 1-9 Backplane Grant Continuity



Four 120-ohm resistor packs between backplane slots twelve and thirteen are used to terminate the Q22-bus.

The thirteenth slot of the backplane provides space for two dual-height modules (rows AB and CD). The Q22-bus is not implemented in this slot. The CD rows are used for the signal distribution board. The AB rows are available for future use. The thirteenth slot provides +5vdc, +12vdc, ground, and a signal (DCOK) that indicates that the DC voltage from the power supply is stable.

NOTE

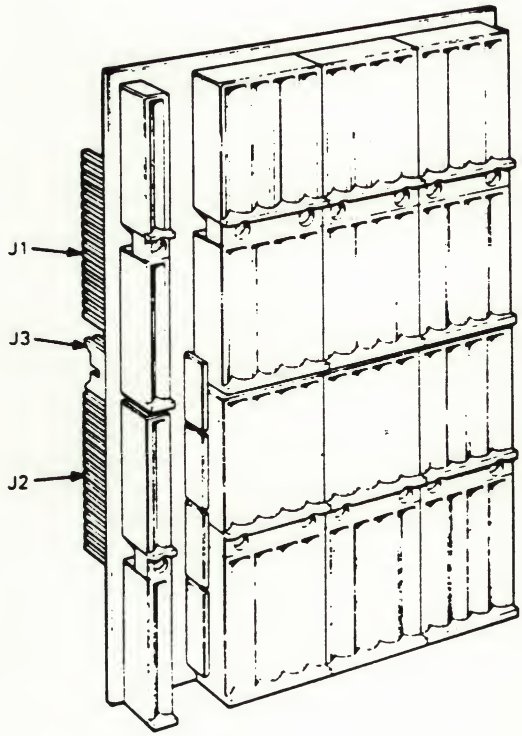
> This backplane is a 'bounded' system. That is, an additional backplane cannot be connected to the system.

The backplane supports a maximum of 38 AC loads and 20 DC loads. Figure 1-10 shows three J connectors on the backplane. J1 and J2 are 18-pin connectors that receive DC power and signals from two independent regulators in the power supply.

The backplane balances the load on each of the power supply's two regulators. Regulator A connects to J1, supplying the odd-numbered slots and the resistor packs. Regulator B connects to J2, supplying the even-numbered slots.

The third connector, J3, is a 10-pin connector for a cable to the CPU console board.

Figure 1-10 Backplane Connectors



The backplane has an eight-layer PC board, which is arranged as follows:

layer	1	signal
	2	signal
	3	+5vdc from regulator A
	4	ground
	5	ground
	6	+5vdc from regulator B
	7	signal
	8	signal

Configuration rules for the backplane are described in Chapter 4.

1.6 Power Supply

The power supply (Figure 1-11) is a 460 watt unit consisting of two regulators. Each regulator supplies power to one-half of the slots in the backplane (see Section 1.5), and to mass-storage devices inside the system.

The power supply provides protection against excess voltage and current, and protection against temporary fluctuations in the AC supply. Table 1-1 lists the minimum and maximum currents supplied by each regulator.

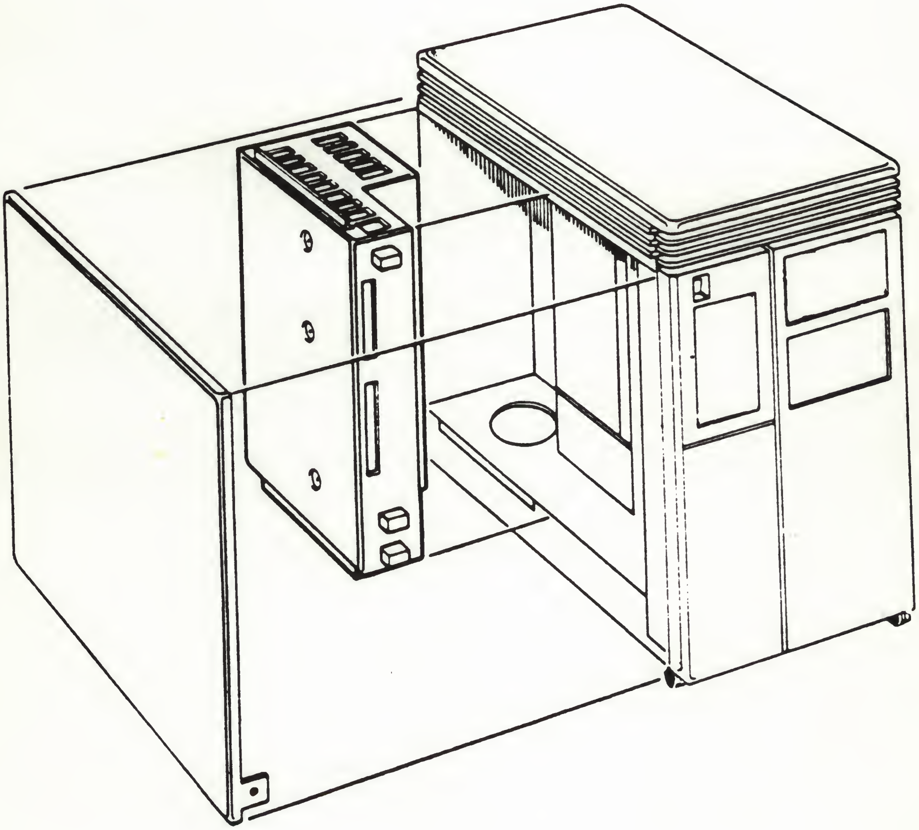
Table 1-1 Regulator A and B Current and Power

	Power	Current at +5vdc		Current at +12vdc	
Regulator	Maximum	Minimum	Maximum	Minimum	Maximum
A	230 watts	4.5 amps	36.0 amps	0.0 amps	7.0 amps
B	230 watts	4.5 amps	36.0 amps	0.0 amps	7.0 amps

NOTE

Total power used from each regulator must not exceed 230 watts. This means that maximum current at +5vdc and +12vdc cannot be drawn at the same time. See figure 4-1, a configuration worksheet, for further information.

Figure 1-11 Power Supply



The power supply also has two separate +12 volt dc outputs that are independent of the main 460 watt output. These are used to drive the two fans that are external to the power supply, and to provide power to the temperature sensor above the card-cage.

The power supply contains a connector at the back for remote control of power. The input power cable is protected by a circuit breaker (figure 1-12). There is an International Electrical Commision (IEC) AC input connector for compatibility with international power cables.

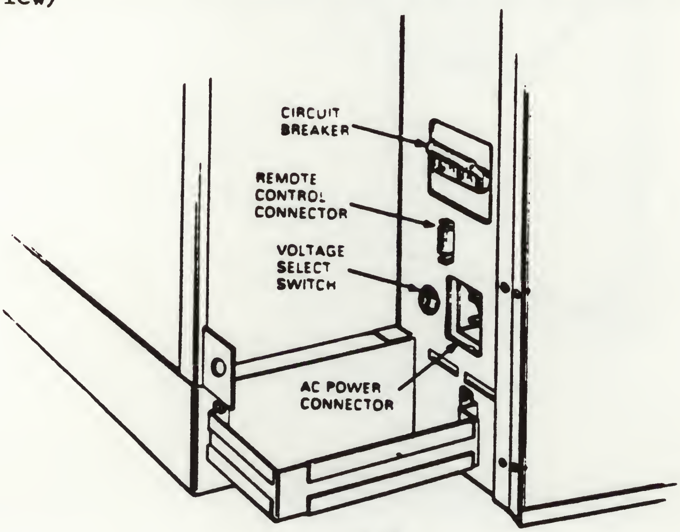
Two voltage ranges can be selected:

120v = 88 - 128 volts ac
240v = 176 - 256 volts ac

NOTE

In order to compensate for line cord voltage drop when the system is operating at maximum load, a minimum of 90 volts AC (88 - 128 volt setting) should be present at the outlet for low line operation.

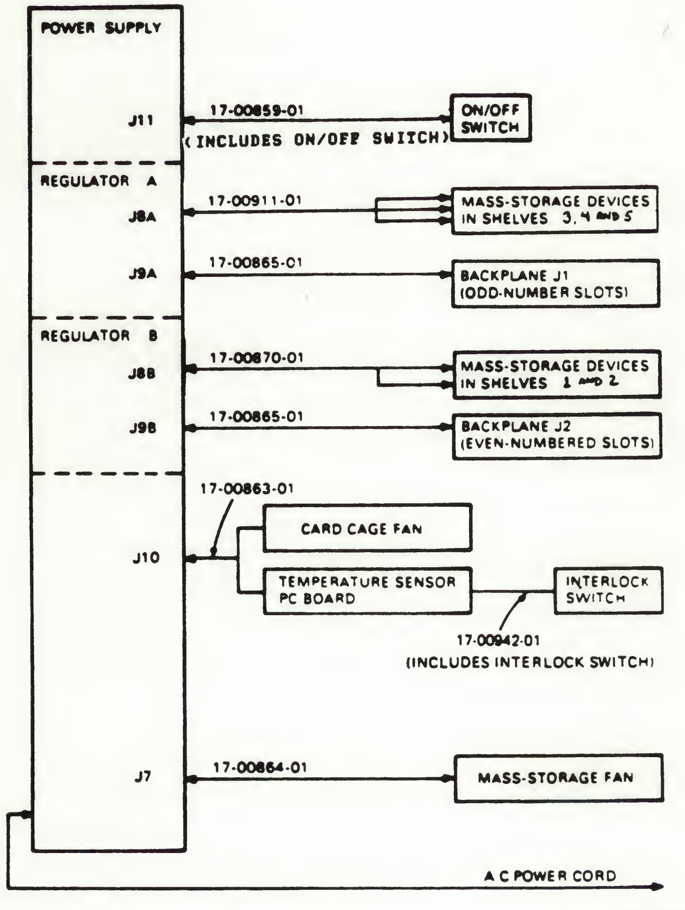
Figure 1-12 Circuit Breaker, Voltage Select Switch, Connectors (Rear View)



1.6.1 Electrical Distribution

Figure 1-13 shows the electrical power distribution of the enclosure. The part numbers of the power cables are also shown.

Figure 1-13 Electrical Distribution



1.7 I/O Distribution Panel

The I/O distribution panel is used for connecting the system to external devices. The rear door provides access to the I/O distribution panel (Figure 1-14).

Each module that connects to an external device comes with an internal cable, a filter connector, and an insert panel. Together, these three items are referred to as a cabinet kit.

Filter connectors are mounted in the insert panels. The insert panels are then mounted in cutouts in the I/O distribution panel, in the order shown in figure 1-14. The CPU I/O Distribution Panel insert is typically mounted in cutout "A". Unused cutouts are covered by removable plates.

> **NOTE**
>
> The phrase 'type XX filter connector' used in this manual refers to an insert panel, and to a filter connector which has been mounted in the insert panel. This configuration is typical of what is shipped in a cabinet kit.

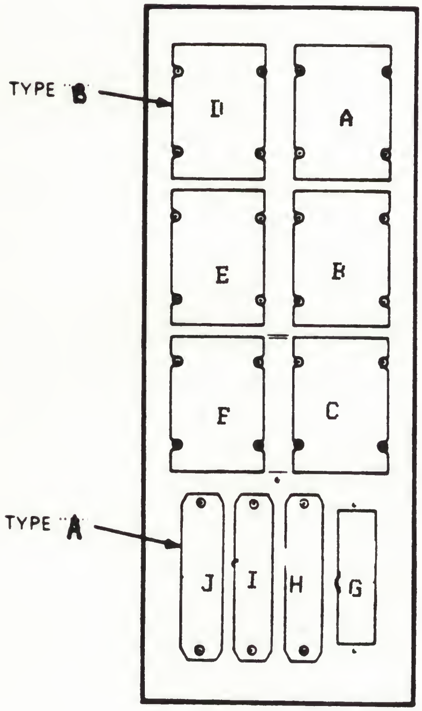
The rear I/O panel has ten cutouts (Figure 1-15):

Each of the four type A cutout measures 1.5 x 8.1 cm (.6 x 3.2 in)
The six type B cutouts are 5.7 x 8.1 cm (2.25 x 3.2 in).

Insert panels correspond to the I/O panel cutouts as follows:

Type A panels are 2.5 x 10.2 cm (1 x 4 in), and type B panels are 6.3 x 8.1 cm (2.5 x 3.3 in).

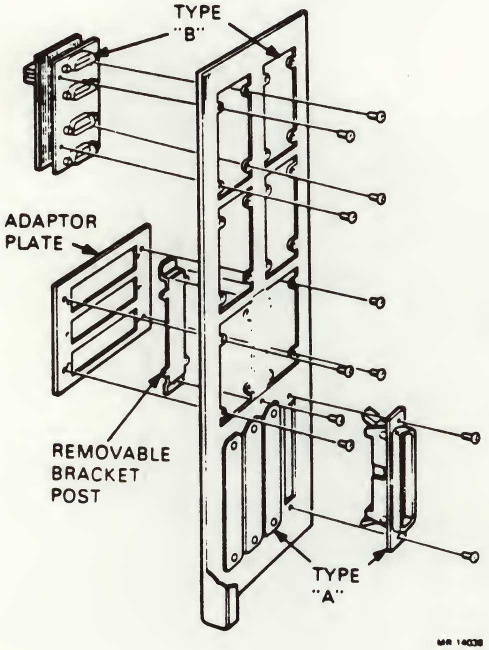
Figure 1-14 Rear I/O Panel



In addition, a removable bracket post between the bottom 2 type B cutouts allows for the addition of 3 more type A cutouts by installing an adaptor plate (DIGITAL P.N. 74-27720-01).

Figure 1-15 shows typical type A and type B connectors, and the adaptor plate.

Figure 1-15 Filter Connectors and Adaptor Plate



CHAPTER 2 - BASE SYSTEM

2.1 Introduction

A MicroVAX II base system includes a system enclosure, a KA630-A CPU module, and a CPU Patch Panel Insert. The CPU module, which includes its own local memory, will also support one or two MS630- memory modules, adding up to 8MByte of additional local memory.

2.2 KA630-A CPU

Two KA630-A CPU versions are available for MicroVAX II systems, the KA630-AA, with floating point, and the KA630-AB, without floating point. They include the following features:

MicroVAX processor chip, which provides a subset of the VAX instruction set and data types, as well as full VAX memory management.

1 MByte of on-board memory, with support for up to two MS630-A memory modules.

Floating Point Processor (FPP) chip (KA630-AA only), which provides a subset of the VAX floating-point instruction set and data types.

Console serial-line unit (SLU) with externally selectable baud rate. The console SLU is accessed using four VAX internal processor registers (IPRs).

Interval timer, with 10 millisecond interrupts. Interrupts are enabled via an IPR.

64 KByte boot/diagnostic ROM, which provides a subset of the VAX console program, power-up diagnostics, and boot programs for standard devices.

Q22-bus map/interface. Direct Memory Access (DMA) for all local memory. The KA630-A fields Q22-bus interrupt requests BR7-4.

Virtual memory space of four gigabytes (2**32)

The KA630-A supports the following VAX data types:

* byte, word, longword, quadword
* character string
* variable length bit field
* f_floating, d_floating and g_floating (KA630-AA only)

The remaining VAX data types are supported through software emulation.

The KA630-A implements the following subset of the VAX instruction set:

* integer
* address
* variable length bit field
* control and procedure call
* queue
* MOVC3/MOVC5
* floating point (KA630-AA only)

The remaining VAX instructions, including floating point for the KA630-AB version, are supported through software emulation.

The KA630-A CPU communicates with mass-storage and peripheral devices via the Q22-bus. The KA630-A communicates with MS630 memory modules through the MicroVAX local memory interconnect in the CD rows of backplane slots 1 through 3, and through a cable between the CPU and the MS630 memory module.

The KA630-A (figure 2-1) CPU contains three connectors:

* J1, for a cable connecting to an MS630 memory module.

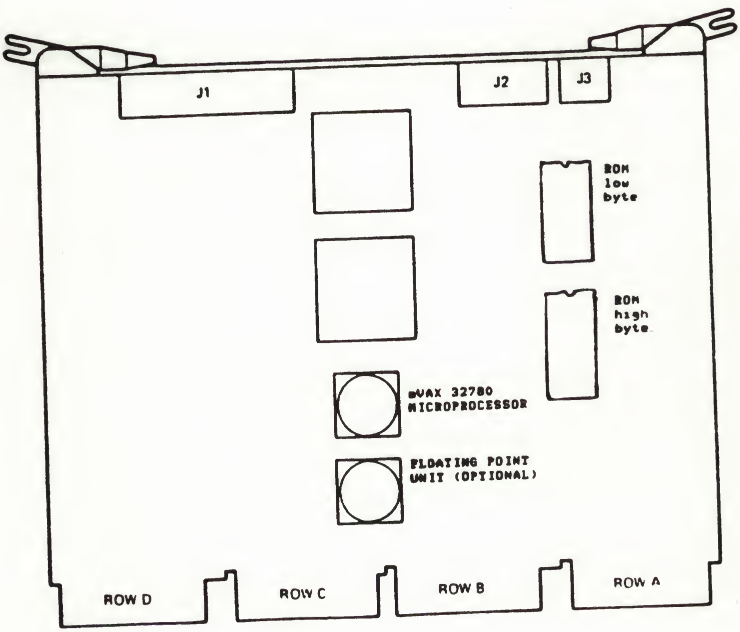
* J2, for a cable to the configuration and display connector on the CPU Patch Panel Insert.

* J3, for a cable to the internal console SLU connector on the CPU Patch Panel Insert.

CAUTION

The KA630-A CPU module can only be installed into a slot that contains the MicroVAX local memory interconnect. It is normally installed in slot 1. It must not be installed in slots 4 - 12.

Figure 2-1 KA630-A CPU Module



2.2.1 Console Program

The console program, resident in two ROM chips on the module, receives control whenever the processor halts. For the KA630-A CPU, a halt means only that processor control has passed to the console program, not that instruction execution stops. The processor halts as a result of the following:

* system power-up or restart button pushed
* an external halt signal
* execution of a halt instruction
* a system error

At power-up, the system enters one of three power-up modes, which are set using a switch on the CPU Patch Panel Insert (section 2.2.3). The console program then determines console device type and console language.

If the console device supports the Multinational Character Set (MCS), the console program may be directed to output the console program in any one of 11 languages. The user language is recorded in battery backed up RAM (see section 2.2.3) so that the preferred language is retained when the system is shut off.

If the console device does not support the MCS, no language prompt will occur and the console program will default to English.

The message "Performing normal system tests." is displayed. A countdown of ongoing diagnostic tests is displayed on the console terminal, on the LED Display on the CPU Patch Panel Insert, and on the CPU module's LEDs. These diagnostics test the CPU, the memory system and the Q22-bus interface. The diagnostic test codes and corresponding messages are described in Chapter 5.

If the halt has been caused by a condition other than power-up, the console program will branch directly to service the halt. The console program may branch to diagnostics, to a restart sequence, to a primary bootstrap routine, or to 'console I/O' mode, depending on the nature of the halt.

If halts are enabled by the switch on the CPU Patch Panel Insert (section 2.2.3), the console program will enter 'console I/O mode' in response to any halt condition, including system power-up. Console I/O mode allows the user to control the system through the console terminal using a console command language (described in Appendix B). The console I/O mode prompt is " >>> ".

2.2.2 Primary Bootstrap Program (VMB)

If halts are disabled by the CPU Patch Panel switch, and the diagnostic tests are completed successfully, the console program will try to load and start (bootstrap) an operating system. To do so, it searches for a 64 Kbyte segment of correctly functioning system memory. It then copies a primary bootstrap program, called VMB, from the console program ROM into the base address of the segment plus 512. The console program then branches to the VMB, which attempts to bootstrap an operating system from one of the following devices, in the order shown.

Table 2-1 Console Program Boot Sequence

	Controller Type	Q22-bus CSR address	Controller	Designation
1.	MSCP (Disk)	17772150 (first) floating (additional)	RQDX RC25 KDA	DUmn * DAmn DJmn (removable disk) DUmn (fixed disk)
2.	MSCP (Tape)	17774500 (first) floating (second)	TQK50	MUmn
3.	PROM	program searches for valid signature block at 4Kbyte boundaries within Q22-bus address range	MRV11	PRAn
4.	Ethernet adapter	17774440 (first) 17774460 (second)	DEQNA	XQAn XQBn

* m = MSCP disk designator (A = first, B = second etc.)
  n = unit number

When VMB determines that a controller is present, it searches in order of increasing unit number for an bootable unit with a removable volume. If it finds none, it will repeat the search for a non-removable volume.

The system can also be directed to enter VMB through console I/O mode by using the boot command, followed by the unit designation and number (for example, b dua0).

When the operating system is booted, the processor no longer executes instructions from the console program ROM. The processor is then in 'program I/O mode', in which terminal interaction is handled by the operating system.

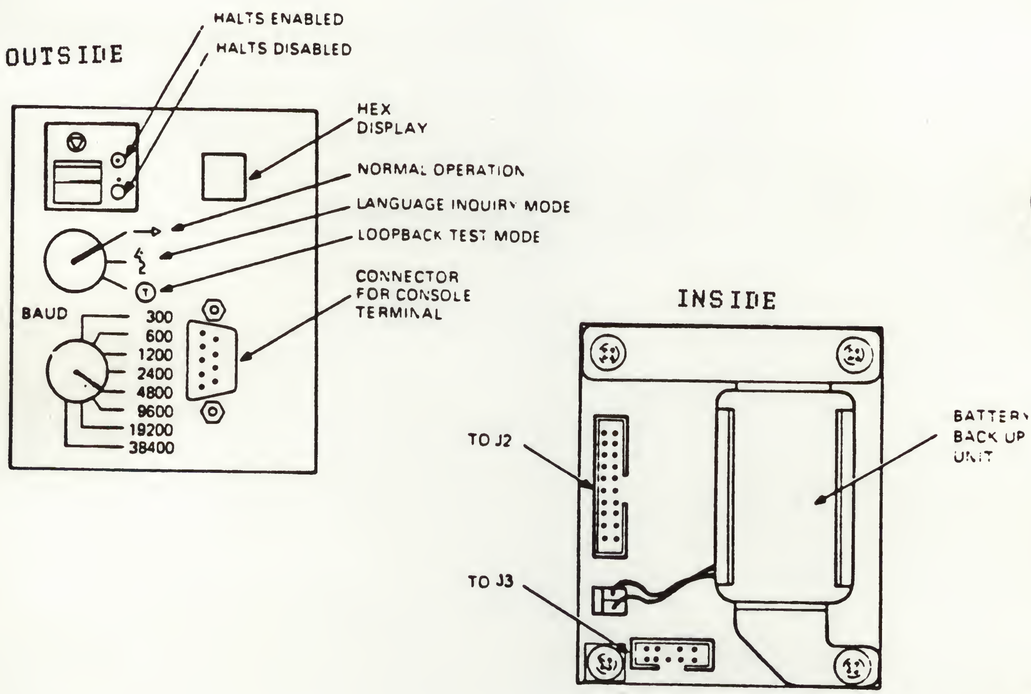
2.2.3 CPU Patch Panel Insert

The CPU Patch Panel Insert (figure 2-2) is mounted in the I/O distribution panel of the BA123-A enclosure.

The CPU Patch Panel Insert contains the following:

- 3 switches
- 1 LED display
- 1 external connector
- 2 internal connectors
- 1 battery backup unit (BBU)

Figure 2-2 CPU Patch Panel Insert



The three switches on the CPU Patch Panel Insert provide the following functions:

1 **Halt Enable** - (2-position toggle)

Switch Position	Function
Down (dot outside circle)	Halts are disabled (factory setting). On power-up or restart, the system will attempt to load software from one of the boot devices at the completion of start-up diagnostics.
Up (dot inside circle)	Halts are enabled. On power-up or restart, the system will enter console I/O mode at the completion of start-up diagnostics.

2 **Power-Up Mode Selection** - (3-position rotary)

Switch Position	Mode
0 (arrow)	Run (factory setting). If the console terminal supports the MCS, the user will be prompted for language only if the battery backup has failed. Full start-up diagnostics are run.
1 (face)	Language inquiry. If the console terminal supports MCS, the user will be prompted for language on every power-up and restart. Full start-up diagnostics are run.
2 (T in a circle)	Test. ROM programs run wrap-around serial-line unit (SLU) tests.

3 **Baud Rate Select** - (8-position rotary)

Sets the baud rate of the console terminal serial-line. The factory setting is 4800 baud. The baud rate of this switch must match that of the console terminal itself.

LED Display

Displays numbers of on-going steps of power-up tests and booting procedures. If a failure occurs, the display indicates the field replaceable unit (FRU) that is the most probable cause of the failure. Chapter 5 lists the definitions of the test numbers.

Console SLU Connector - (external)

9-pin connector for a cable to the console terminal.

Console SLU Connector - (internal)

9-pin connector for a cable to connector J3 of the KA630-A CPU.

Configuration and Display Connector - (internal)

20-pin connector for a cable to connector J2 of the KA630-A CPU. Connects the three switches and the LED display to the CPU.

Battery Backup Unit (BBU) - (internal)

Provides power to the time-of-year (TOY) clock chip on the KA630-A CPU when the system is off. The code for the user's language is stored in RAM on this chip and is lost if the BBU fails.

For further information, refer to the KA630-A CPU Module User's Guide (EK-UVAX2-TM).

2.3 MS630 Memory Module

The MS630 memory module provides memory expansion for the KA630-A CPU module. It is available in three versions (Table 2-2), all populated with 256K RAM chips.

Table 2-2 MS630 Memory Module Versions

Version	Storage (Mbyte)	Module Height	Module Number
MS630-AA	1	Dual	M7607-AA
-BA	2	Quad	M7608-AA
-BB	4	Quad	M7608-BA

One or two MS630 modules can be used in the MicroVAX system. The MS630 modules interface with the KA630-A CPU through the MicroVAX local memory interconnect in the CD rows of slots 1 through 3 of the backplane, and through a 50-pin cable. This cable is installed between J1 of the KA630-A CPU and the corresponding J connector on one or both MS630 modules.

No hardware settings on the module are necessary.

CAUTION

MS630-B modules can only be installed in slots 2 or 3. They must not be installed in Q22-bus slots. MS630-AA can only be installed in the CD rows of slots 2 and 3.

Chapter 3 - SYSTEM OPTIONS

3.1 Introduction

This chapter describes the options currently supported by the MicroVAX II system. These options, as well as commonly used peripheral devices, are broken down into the following categories:

1. Communications
2. Disk Storage Devices
3. Tape Storage Devices

Each option section includes configuration set-ups and a description of the cabinet kit required to install the module. Detailed documentation for each device is also listed.

NOTE
Current and bus loads for the following options are listed in chapter 4, table 4-1.

3.1.1 Ordering Options

Two items must be ordered to get all the parts necessary for an option: a base module and a cabinet kit.

Example:	DEQNA-M	base module
	CK-DEQNA-KA	cabinet kit

3.1.2 Module Configuration

Each module in a system has a device address, commonly referred to as a control and status register (CSR) address, and an interrupt vector, which must be set when the module is installed. The CSR address and interrupt vector are either fixed or floating.

A fixed address or vector means that there is an address location reserved in memory for the address or vector of that particular module. Modules with fixed addresses and vectors are usually shipped with the correct configuration for use as the first module of that type. If two modules of the same type are used, the factory setting for the second module must be changed.

A floating address or vector is assigned a location within an octal range. The exact address or vector within the range will depend on what other modules are in the system. The ranges are as follows:

floating CSR address: (1776)0010 - (1776)3776

floating interrupt vector: (00000)300 - (00000)774

Chapter 4 provides guidelines for determining floating CSR address and interrupt vector settings.

The address and vector settings are usually configured by means of switches or jumpers on the module. For example, the 22-bit setting for a CSR address of 17761540 is as follows:

```
A
21 20 19 18 17 16 15 14 13 12 11 10  9  8  7  6  5  4  3  2  1  0
1  1  1  1  1  1  1  1  1  0  0  0  1  1  0  1  1  0  0  0  0  0
^  ^______^  ^______^  ^______^  ^_______^  ^______^  ^______^  ^______^
1     7        7        6         1        5        4        0
-----------------------------------------------------------------
```

It is not necessary to change bits 21 - 13. It is only necessary to be able to change bits A12 - A2 to set the CSR address within a typical range. A typical switch setting would only show the following switches:

```
Switch      A12 A11 A10  A9  A8  A7  A6  A5  A4  A3 <- Add. bits
setting -> 0    0   0    1   1   0   1   1   0   0
-------------------------------------------------------------
            ^   ^-------^   ^-------^   ^-------^
            6 *     1           5           4
-------------------------------------------------------------
* if A12 were set to a 1, this would be a 7
-------------------------------------------------------------
```

Similarly, an interrupt vector of 320 is typically configured using only the following bits:

```
Switch      V8    V7    V6    V5    V4    V3  <- Vector bits
setting -> 0     1     1     0     1     0
-----------------------------------------------------
            ^---------^   ^----------^
                 3              2
-----------------------------------------------------
```

NOTE

The switch layout for different modules varies. The line below the switch setting for each module shows the octal boundaries.

3.2 Communications

3.2.1 DEQNA Ethernet Interface

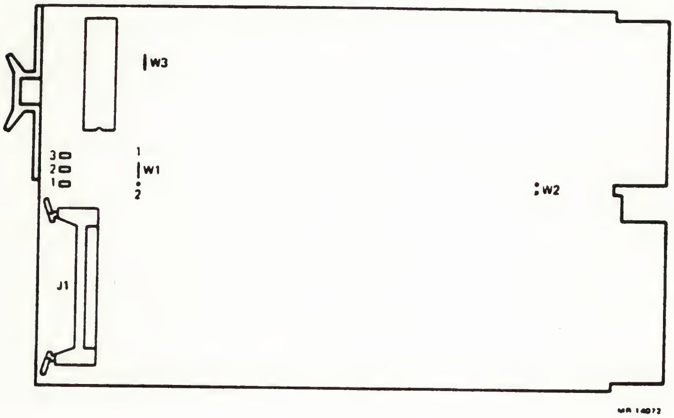
Order:	DEQNA-M	base module
	CK-DEQNA-KA	cabinet kit (type A filter connector and internal cable)

Module Number: M7504

The DEQNA is a dual-height module used to connect a Q-bus system to a local area network (LAN) based on Ethernet. The Ethernet is a communications system which allows data exchange between computers within a moderate distance (2.8 km/ 1.74 mi). The DEQNA can transmit data at a rate of 1.2 Mbytes per second, through coaxial cable. For high Ethernet traffic, an additional DEQNA may be installed.

The module is configured using three jumpers, W1 through W3 (figure 3-1).

Figure 3-1 DEQNA Module Layout



Jumper 1 (W1) determines the CSR address assignment. The DEQNA CSR addresses are fixed, as follows:

Module	CSR Address
1	17774440
2	17774460

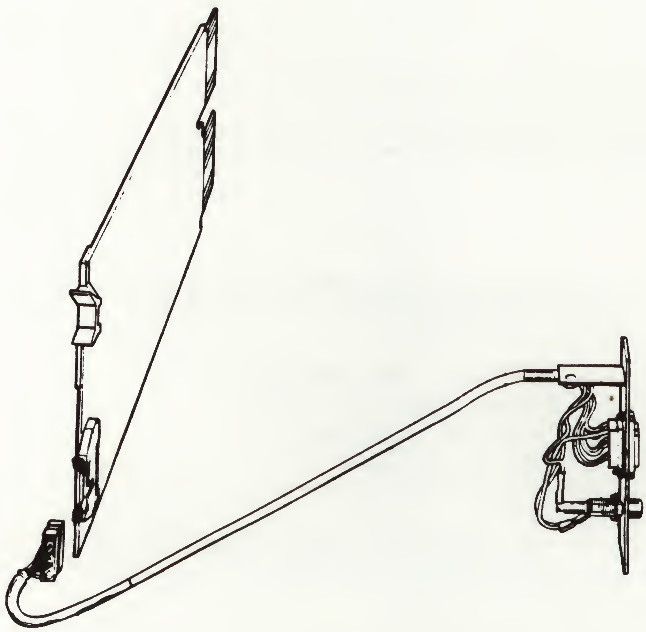
If two DEQNAs are to be installed, move jumper W1 of the second DEQNA onto the left and center pins (module edge towards you, figure 3-1).

The interrupt vector is written into a read/write register by software. No hardware configuration is required. The interrupt vectors are as follows:

Module	Interrupt Vector
1	120
2	floating

Jumper W2 is normally removed. When removed, it provides 'fair' access to all DMA devices using the Q22-bus by causing the DEQNA to wait 5 usecs. before re-requesting the bus. Jumper W3 is normally installed. When installed, it disables a sanity timer at initialization. Figure 3-2 shows the internal cabling for the DEQNA.

Figure 3-2 DEQNA Internal Cabling



For further information, refer to the DEQNA User's Guide (EK-DEQNA-UG-001).

3.2.2 DHV11 Asynchronous Multiplexer - (eight lines)

Order:	DHV11-M	base module
	CK-DHV11-AA	cabinet kit (2 type B filter connectors, 2 internal cables)

Module Number: M3104

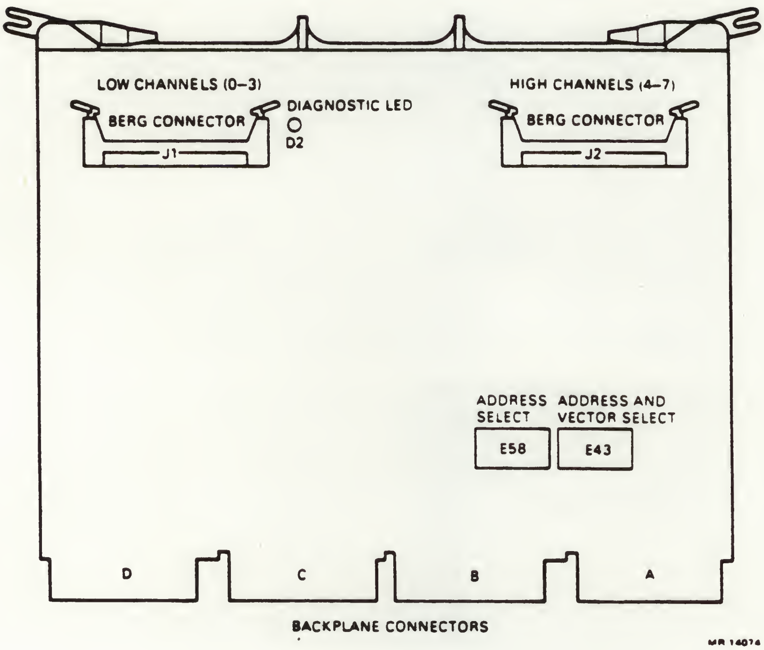
The DHV11 (figure 3-3) is an asynchronous multiplexer that provides support for up to eight serial lines, for data communications. It is a quad-height module with the following features:

* full modem control
* DMA or silo output
* silo input buffering
* split speed

The DHV11 is compatible with the following modems:

Digital modems:	DF01
	DF02
	DF03
	DF112
Bell modems:	103
	113
	203c
	202d
	212

Figure 3-3 DHV11 Module Layout



The CSR address and interrupt vector of the module are set using two DIP switches, E58 and E43 (figure 3-3). The CSR address and interrupt vector are floating. Tables 3-1 and 3-2 show the factory and common settings.

Table 3-1 DHV11 CSR Address

CSR Address	A12 E58 1	A11 2	A10 3	A9 4	A8 5	A7 6	A6 7	A5 8	A4 E43 1	<-Add. bits <- Switches
17760460	0	0	0	0	1	0	0	1	1	(factory)
17760440	0	0	0	0	1	0	0	1	0	
17760500	0	0	0	0	1	0	1	0	0	

1 = switch on   0 = switch off

Table 3-2 DHV11 Interrupt Vector

Settings	V8 E43-3	V7 4	V6 5	V5 6	V4 7	V3 8	<- Switch *
300	0	1	1	0	0	0	(factory)
310	0	1	1	0	0	1	

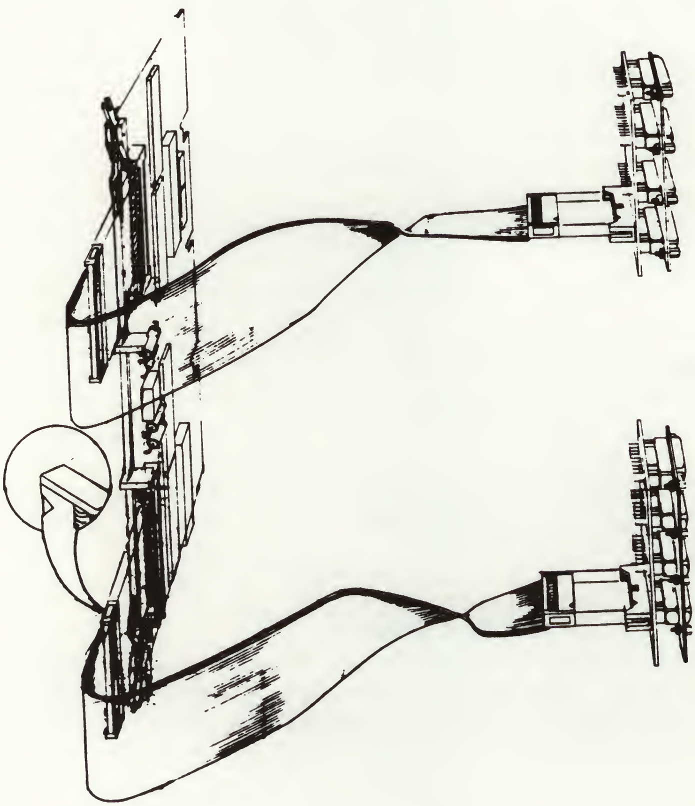
1 = switch on   0 = switch off
* E43 switch 2 is not used

NOTE

The actual address and vector of the DHV11 will depend on what other modules are installed in the system. Refer to paragraph 4.1.5 for guidelines for setting the address and vector.

Figure 3-4 shows the internal cabling for the DHV11. The internal cables should be installed with the red stripe side connected to pin A (pin 1) of the DHV11 connectors. The other end of the cables should then be installed with the red stripe aligned with the small arrow (pin 1) on the filter connector.

Figure 3-4 DHV11 Internal Cabling



For further information, refer to the DHV11 Technical Manual (EK-DHV11-TM-001).

3.2.3 DLVJ1 Asynchronous Interface - (four lines)

Order:	DLVJ1-M	base module
	CK-DLV11-LA	cabinet kit (type B filter connector, internal cable)

Module Number: M8043

The DLVJ1 (formerly DLV11-J) is a dual-height module that connects a Q-bus to up to four asynchronous serial lines (channels 0 - 3), for data communications. The serial lines must conform to EIA and CCITT standards. The DLVJ1 acts as four separate devices.

NOTE

The DLVJ1 is not supported by the MicroVMS operating system.

The DLVJ1 module is configured using wire-wrap pins (figure 3-5). The CSR address for two DLVJ1 modules are fixed. Table 3-3 lists the factory setting for the CSR address of the first channel (CH-0). The CSR address of the other channels is 10 (octal) greater. For example, if CH-0 is set at 17776500, the CH-1 CSR address will be 17776510, CH-2 will be 17776520 etc.

NOTE

The factory configuration of the module must be changed to be used in a MicroVAX system. C1 and C2 must be wire-wrapped on pins 0 and x.

Table 3-3 DLVJ1 CSR Address

Module	CH-0 CSR Address	A12	A11	A10	A9	A8	A7	A6	A5 <-Add. bits
1	17776500	1-x	1-x	1-x	0-x	1-x	R	x-h	0-x (factory)
2	17776540	1-x	1-x	1-x	0-x	1-x	R	x-h	1-x

R = no wire-wrap = 0
x-y = wire-wrap on pins pins x and y
0-x = 0   1-x = 1

The interrupt vector is floating and is configured using wire-wrap pins. The interrupt vector of channel 0 can only be set at X00 or X40. The interrupt vector of the remaining channels is then 10 (octal) greater. For example, if the module is set at 300, then the interrupt vector of CH-1 is 310, CH-2 is 320 etc. The factory configuration is shown in table 3-4.

Table 3-4 DLVJ1 Interrupt Vector

Settings	V8	V7	V6	V5	V4	V3 <- Vector bits	
300	-	x-h	x-h	0-x	-	-	(factory)
340	-	x-h	x-h	1-x	-	-	

x-h = jumper inserted between pins x and h = 1
0-x = jumper inserted between 0 and x = 0
1-x = jumper inserted between 1 and x = 1

NOTE

The actual interrupt vector of the DLVJ1 depends on the other modules in the system. Refer to paragraph 4.1.5 for guidelines for determining the interrupt vector.

Figure 3-5 DLVJ1 Module Layout

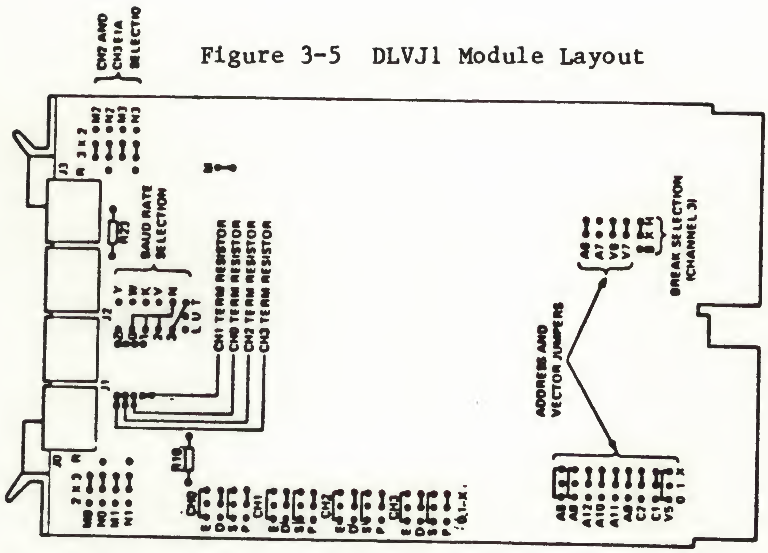
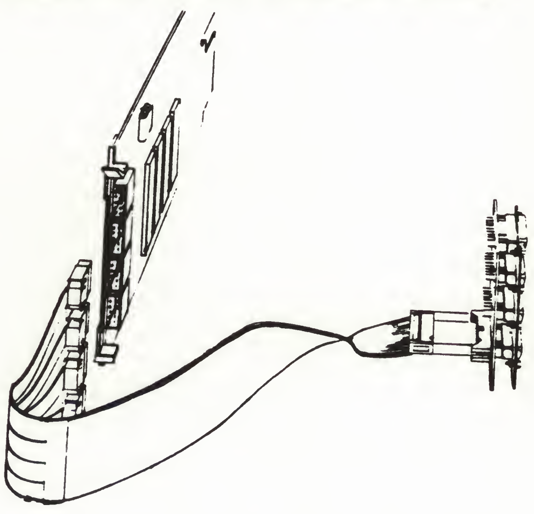


Figure 3-6 shows the internal cable set-up for the DLVJ1.

Figure 3-6 DLVJ1 Internal Cabling



For further information, refer to the DLV11-J Users Guide (EK-DLVIJ-UG).

3.2.4 DMV11 Synchronous Controller

The DMV11 is a quad-height module that supports:

* full-duplex or half-duplex operations
* DMA
* point-to-point communications
* multipoint communications

It is available in four system options. The option you choose depends on the interface requirements of your system. Table 3-5 lists the four system options and corresponding upgrade components. Table 3-6 lists the interface for each system option, and the appropriate external cable.

Table 3-5 DMV11 Versions

Order (base module + cabinet kit)	Module number	Module connector	I/O Panel insert type
DMV11-M + CK-DMV11-AA	M8053	J2 (of 2)	B
-M + -BA	M8053	J1 (of 2)	A
-N + -CA	M8064	J1 (of 1)	B
-M + -FA	M8053	J2 (of 2)	B

Table 3-6 DMV11 Interfaces

Order (base module + cabinet kit)	Interface	External cable
DMV11-M + CK-DMV11-AA	EIA RS232-C/CCITT V.28	BC22E or BC22F
-M + -BA	CCITT V.35/DDS	BC17E *
-N + -CA	integral modem	BC55S orBC55T
-M + -FA	EIA RS423-A/CCITT V.24	BC55D

* cable included in the -BA cabinet kit

The CSR address and interrupt vector of the DMV11 are configured by means of DIP switches (figure 3-7, 3-8). The CSR address and interrupt vector are both floating. Tables 3-7 and 3-8 show the factory settings and other common settings.

Table 3-7 DMV11 CSR Address

	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	<- Add. bits
	E53 (M8053) E58 (M8064)								E54 (M8053) E59 (M8064)		<-Switches
CSR Address	8	7	6	5	4	3	2	1	2	1	
17760320	0	0	0	0	0	1	1	0	1	0	
17760340	0	0	0	0	0	1	1	1	0	0	(factory)
17760360	0	0	0	0	0	1	1	1	1	0	

1 = on = closed   0 = off = open

Table 3-8 DMV11 Interrupt Vector

	V8	V7	V6	V5	V4	V3	<- Vector bits
	E54 (M8053) E59 (M8064)						<- Switches
Interrupt Vector	8	7	6	5	4	3	
300	0	1	1	0	0	0	(factory)
310	0	1	1	0	0	1	

1 = on = closed   0 = off = open

NOTE

The actual settings will depend on the other modules in the system. Refer to paragraph 4.1.5 for guidelines for setting the CSR address and interrupt vector.

Another DIP switch on the DMV11 controls selectable features. Table 3-9 shows the function of this switch, and a common setting.

Table 3-9 DMV11 Switch Selectable Settings

E107 (M8064)
E101 (M8053)

10*	9	8	7	6	5	4	3	2	1
off	off	on	on	on	on	on	on	on	on

on = zero = function disabled
* unused on M8064

Switch 10 OFF for EIA interface, ON for V.35
Switch 9 must be OFF for integral modem (M8064) or when running above 19.2K baud.
Switches 8, 7 and 6 set mode of operation when switch 1 is OFF.
Switch 5 OFF enables Remote Load Detect.
Switch 4 OFF enables Power On Boot.
Switch 3 OFF enables Auto Answer.
Switch 2 determines unit number for booting (ON = first DMV11, OFF = second DMV11).
Switch 1 OFF enables switches 8, 7, 6 to determine mode of operation. Switch 1 ON = mode of operation determined by software.

A DIP switch (E119 on M8064, E113 on M8053) determines the Digital Data Communications Message Protocal (DDCMP) address register tributary/password. This must be set to a unique site address. Further information is contained in the DMV11 Synchronous Controller's User's Guide (EK-DMV11-UG-001).

Figures 3-7 and 3-8 show the location of the DIP switches on the two DMV11 modules. 3-9 and 3-10 show the internal cabling for the four DMV11 interfaces.

Figure 3-7 M8053 Module Layout

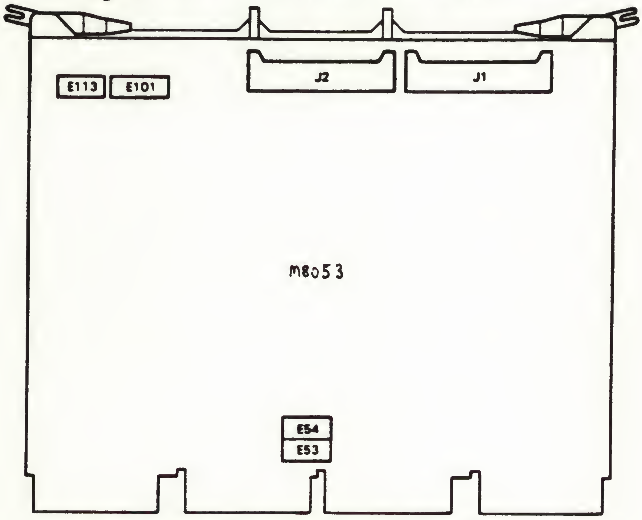


Figure 3-8 M8064 Module Layout

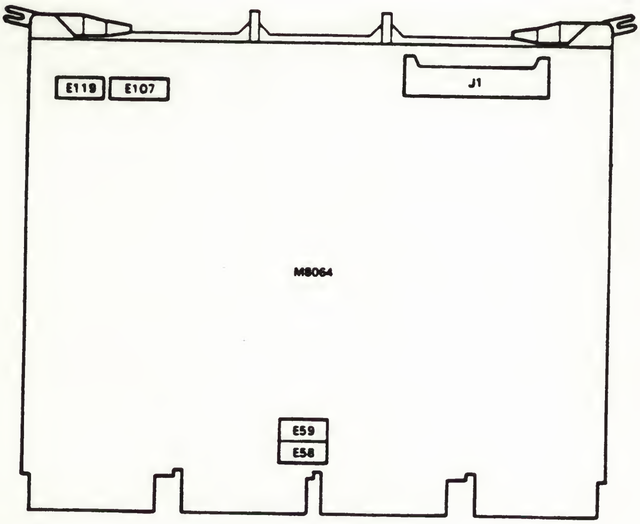


Figure 3-9 M8053 Internal Cabling

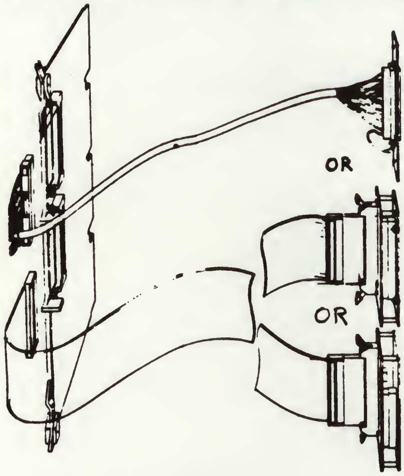
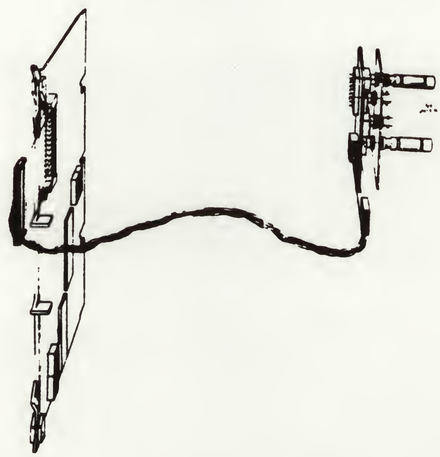


Figure 3-10 M8064 Internal Cabling



For further information, refer to the DMV11 Synchronous Controller Technical Manual (EK-DMV11-TM-001).

3.2.5 DPV11 Synchronous Interface

Order:	DPV11-M	base module
	CK-DPV11-AA	cabinet kit (type A filter connector, internal cable)

Module Number: M8020

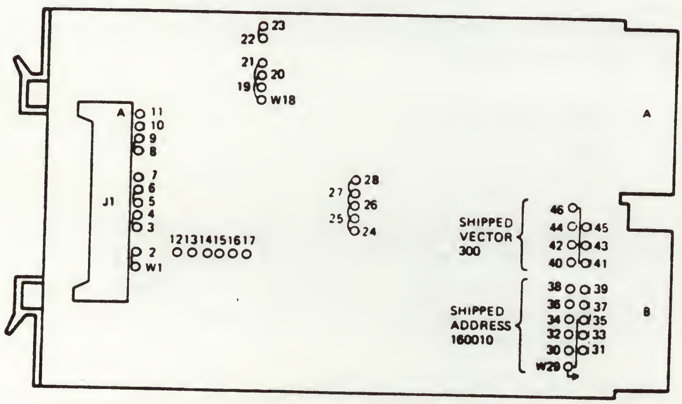
The DPV11 is a dual-height module that connects the Q-bus to a modem, using a synchronous serial-line. The serial-line conforms to the following EIA standards:

RS-232-C
RS-423-A
RS-422-A

EIA compatibility is provided for use in local communications only (timing and data leads only). The DPV11 is intended for character-oriented protocols, such as DDCMP, or communication protocols that are bit-oriented, such as Synchronous Data-Link Control (SDLC).

The CSR address and interrupt vector of the DPV11 are configured by means of jumpers (figure 3-11).

Figure 3-11 DPV11 Module Layout



The CSR address and interrupt vector are both floating. Tables 3-10 and 3-11 show factory and common settings.

Table 3-10 DPV11 CSR Address

Setting	A12 W31	A11 W30	A10 W36	A9 W33	A8 W32	A7 W39	A6 W38	A5 W37	A4 W34	A3 W35	<- Add. bits <- Pin
17760010	0	0	0	0	0	0	0	0	0	1	(factory)
17760270	0	0	0	0	0	1	0	1	1	1	
17760310	0	0	0	0	0	1	1	0	0	1	

1 = jumper inserted between pin Wxx and pin 29 (ground)
0 = jumper removed

Table 3-11 DPV11 Interrupt Vector

Interrupt Vector	V8 W34	V7 W42	V6 W41	V5 W40	V4 W44	V3 W45	<- Vector bits <- Pin
300	0	1	1	0	0	0	(factory)
310	0	1	1	0	0	1	

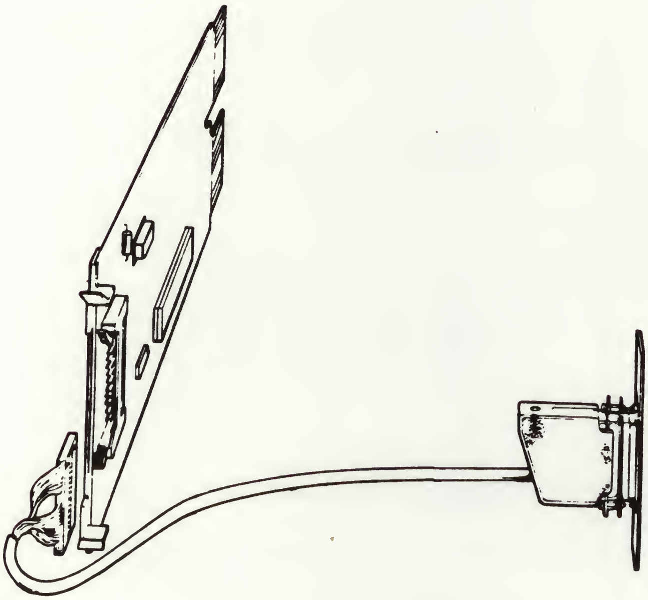
1 = jumper inserted between pin Wxx and pin 46 (ground)
0 = jumper removed

NOTE

The actual settings of the DPV11 will depend on the other modules in the system. Refer to paragraph 4.1.5 for guidelines for setting the CSR address and interrupt vector.

Figure 3-12 shows the internal cabling of the DPV11.

Figure 3-12 DPV11 Internal Cabling



For further information, refer to the DPV11 Synchronous Interface Users Manual (EK-DPV11-UG).

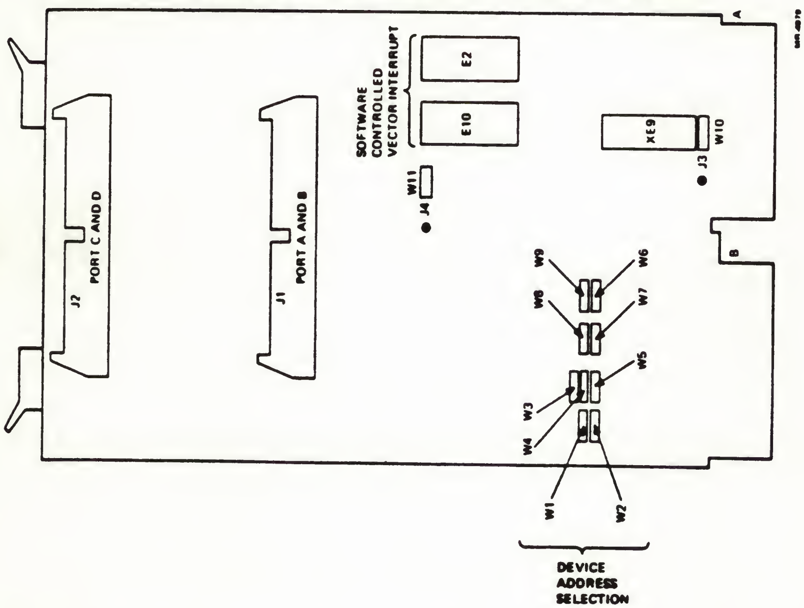
3.2.6 DRV11-J High-Density, Parallel Interface - (four lines)

Order:	DRV11-J	base module
	CK-DRV1J-KB	cabinet kit (2 type A filter connectors, 2 internal cables)

Module Number: M8049

The DRV11-J (figure 3-13) is a dual-height module that connects a Q-bus to 64 I/O lines. These lines are organized as four 16-bit ports, A through D. Data line direction is selectable under program control for each 16-bit port.

Figure 3-13 DRV11-J Module Layout



The interrupt vector is set under program control, eliminating the need for jumper-defined vectors. The CSR address of the module is fixed and is set with jumpers W1 through W9. Table 3-12 lists the factory configuration.

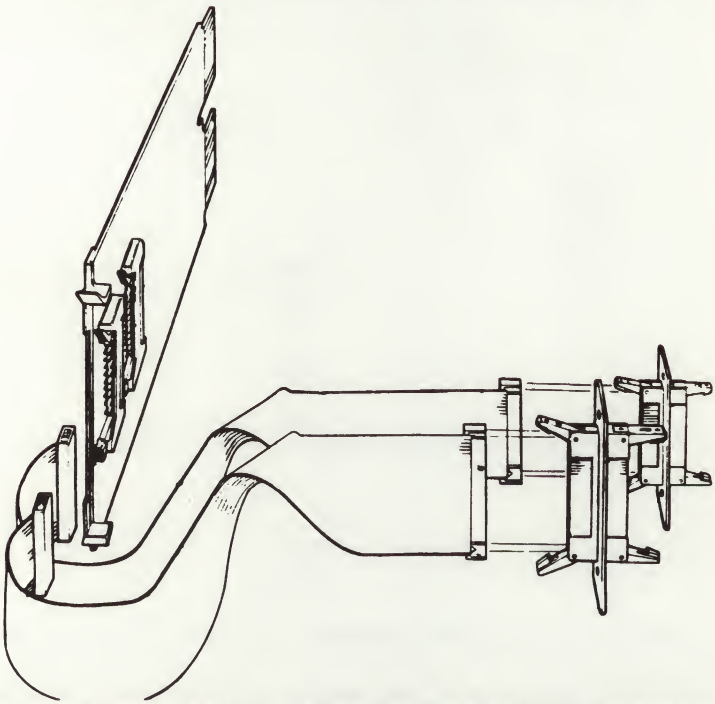
Table 3-12 DRV11-J CSR Address

Module	Starting Address	A12 W1	A11 W2	A10 W3	A9 W4	A8 W5	A7 W6	A6 W7	A5 W8	A4 W9	<- Add. bits <- Jumpers
1	17764160	0	1	0	0	0	0	1	1	1	(factory)
2	17764140	0	1	0	0	0	0	1	1	0	

1 = installed 0 = removed

Figure 3-14 shows the internal cabling layout for the DRV11-J.

Figure 3-14 DRV11-J Internal Cabling



For further information, refer to the DRV11-J Interface User's Manual (EK-DRV1J-UG).

3.2.7 DZQ11 Asynchronous Multiplexer - (four lines)

Order:	DZQ11-M	base module
	CK-DZQ11-DA	cabinet kit (1 type B filter connector, 1 internal cable)

Module Number: M3106

The DZQ11 is a dual-height module that connects the Q22-bus to up to four asynchronous serial lines. It conforms to the RS-232-C and RS423-A interface standards. The DZQ11 permits dial-up (auto-answer) operation with modems using full-duplex operations such as Bell models 103, 113, 212 or equivalent.

The CSR address and interrupt vector of the module are set using two DIP switches, E28 and E13 (Figure 3-15). The CSR and interrupt vector are floating. Tables 3-13 and 3-14 show the factory and common settings.

Figure 3-15 DZQ11 Module Layout

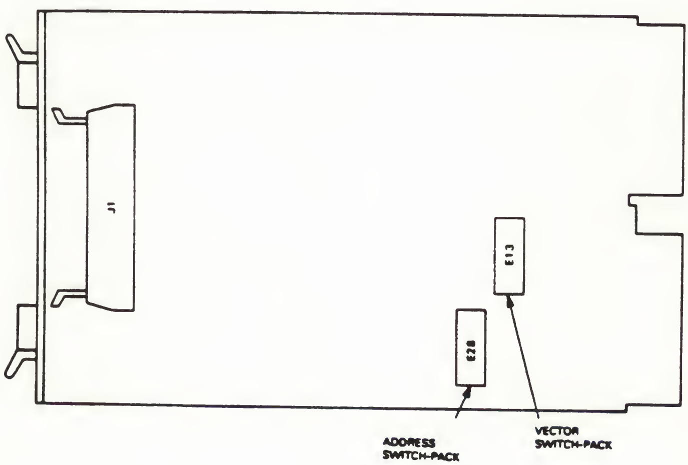


Table 3-13 DZQ11 CSR Address

CSR Address	A12 E28 1	A11 2	A10 3	A9 4	A8 5	A7 6	A6 7	A5 8	A4 9	A3 10 <-switches
17760010	0	0	0	0	0	0	0	0	0	1 (factory)
17760100	0	0	0	0	0	0	1	0	0	0

0 = switch open 1 = switch closed

Table 3-14 DZQ11 Interrupt Vector

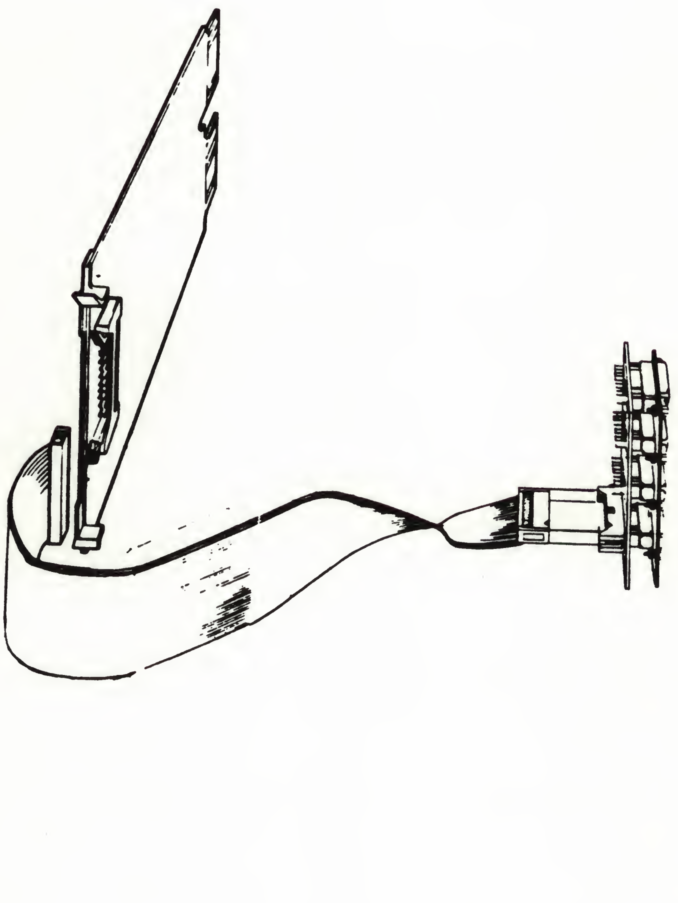
Interrupt Vector	V8 E13 1	V7 2	V6 3	V5 4	V4 5	V3 6 <- switches
300	0	1	1	0	0	0 (factory)
310	0	1	1	0	0	1

0 = switch open 1 = switch closed

Switch 7 of the E13 DIP switch is not used. Switch 8 must be ON, and switches 9 and 10 must be OFF for normal operation.

Figure 3-16 shows the internal cabling for the DZQ11.

Figure 3-16 DZQ11 Internal Cabling



For further information, refer to the DZQ11 Asynchronous Multiplexer's User's Guide (EK-DZQ11-UG-001).

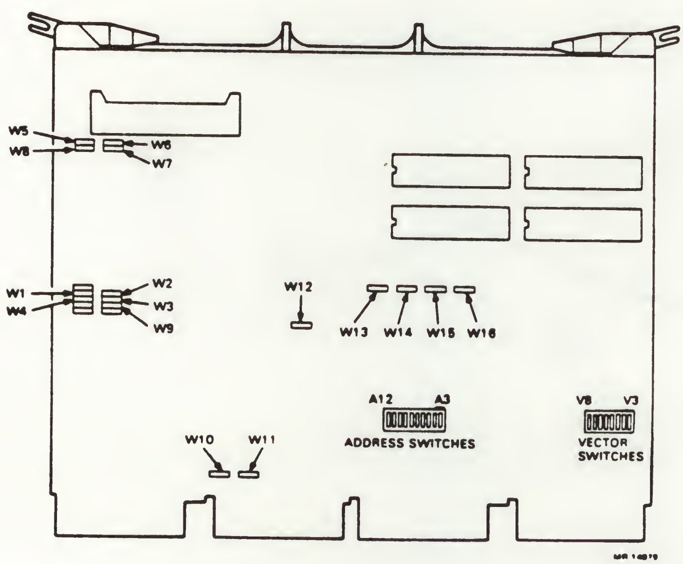
3.2.8 DZV11 Asynchronous Multiplexer - (eight lines)

Order:	DZV11-M	base module
	CK-DZV11-DA	cabinet kit (1 type B filter connector, 1 internal cable)

Module Number: M7957

The DZV11 (figure 3-17) is a quad-height module that connects a Q22-bus to up to four asynchronous serial-lines. It conforms to the RS-232 interface standard, and permits dial-up (auto-answer) operation with modems using full-duplex operations.

Figure 3-17 DZV11 Module Layout



The DZV11 is configured using 16 jumpers and 2 DIP switches.

The CSR address and interrupt vector of the DZV11 are both floating. Tables 3-15 and 3-16 list the factory settings.

Table 3-15 DZV11 CSR Address

CSR Address	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	<- Add. bits
	E30										
	1	2	3	4	5	6	7	8	9	10	<- Switches
17760010	0	0	0	0	0	0	0	0	0	1	(factory)
17760100	0	0	0	0	0	0	1	0	0	0	

1 = switch closed   0 = switch open

Table 3-16 DZV11 Interrupt Vector

Interrupt Vector	V8	V7	V6	V5	V4	V3	<- Vector bits
	E2						
	1	2	3	4	5	6	<- Switches
300	0	1	1	0	0	0	(factory)
310	0	1	1	0	0	1	

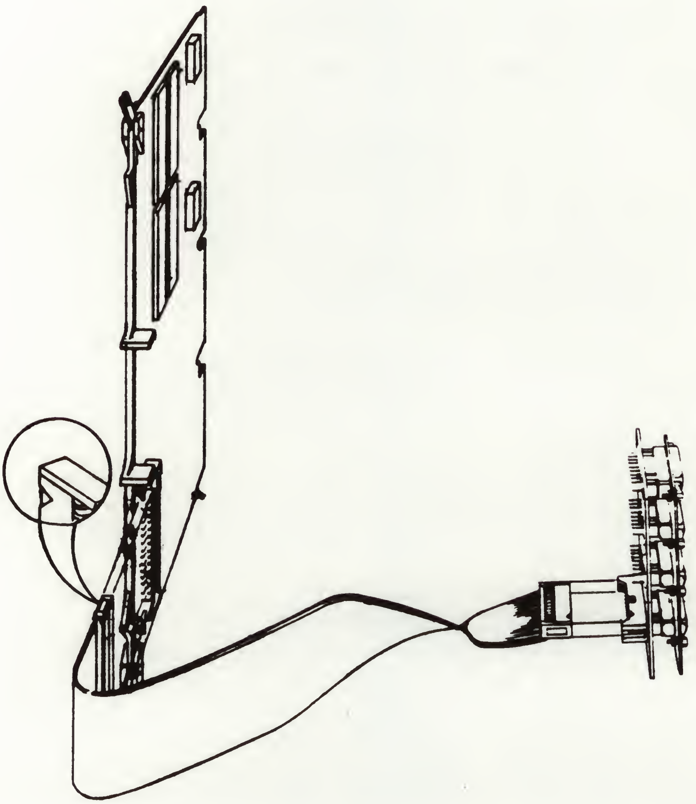
1 = switch closed   0 = switch open

NOTE

The actual settings of the DZV11 will depend on the other modules in the system. Refer to paragraph 4.1.5 for guidelines for setting the CSR address and interrupt vector.

Figure 3-18 shows the internal cabling layout.

Figure 3-18 DZV11 Internal Cabling



For further information, refer to the DZV11 Asynchronous Multiplexer Technical Manual (EK-DZV11-TM).

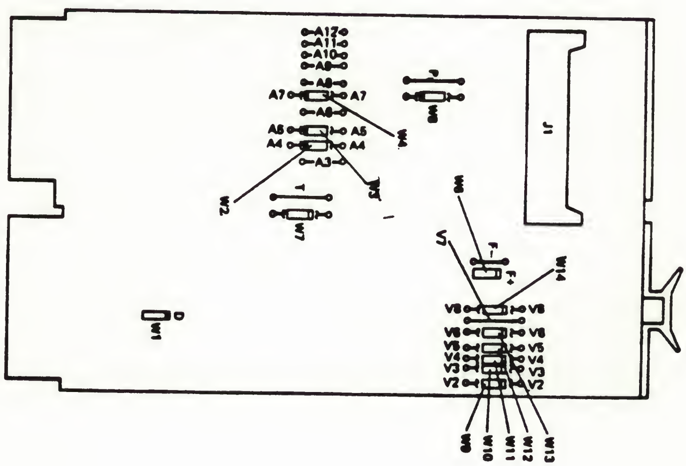
3.2.10 LPV11 Interface Module - (for LP25 system printer)

Order:	LPV11-AD	(includes LP25-DA printer and LPV11 controller) For 64/96 US character set.
	CK-LPV1A-KB	cabinet kit (includes type A filter connector and internal cable)

Module Number: M8027

The LPV11 is a dual-height module that controls the flow of data between the Q-22 bus and a line printer. It is configured using jumpers (figure 3-19).

Figure 3-19 LPV11 Module Layout



The CSR address and interrupt are both fixed. Tables 3-17 and 3-18 list the factory configuration. Figure 3-20 shows the internal cabling set-up.

Table 3-17 LPV11 CSR Address

CSR Address	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	<- Add. bits (jumpers)
17777514	1	1	1	1	1	0	1	0	0	1	(factory)

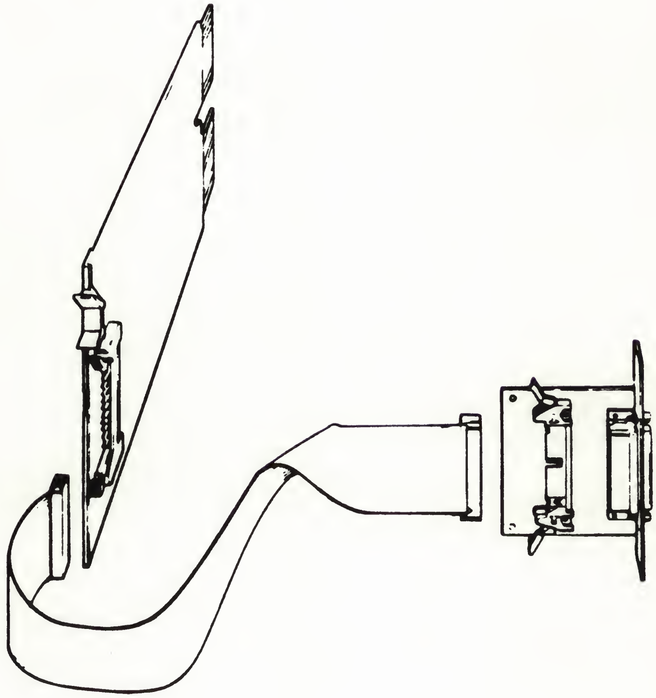
0 = installed 1 = removed

Table 3-18 LPV11 Interrupt Vector

Interrupt Vector	V8	V7	V6	V5	V4	V3	V2	<- Vector bits
	W14	V7	W13	W12	W11	W10	W9	<- jumper
200	0	1	0	0	0	0	0	(factory)

0 = installed 1 = removed

Figure 3-20 LPV11 Internal Cabling



3.3 Disk Storage Devices

3.3.1 RQDX2 Disk Controller

Order: RQDX2-BA (controller kit)

An RQDX2 controller kit includes the following:

1. RQDX2 controller module
2. M9058 : signal distribution board
3. 17-00861-01 : cable, 50 pin I/O, RQDX to M9058
4. 17-00862-01 : cable, 40-pin, M9058 to 4 RD console boards

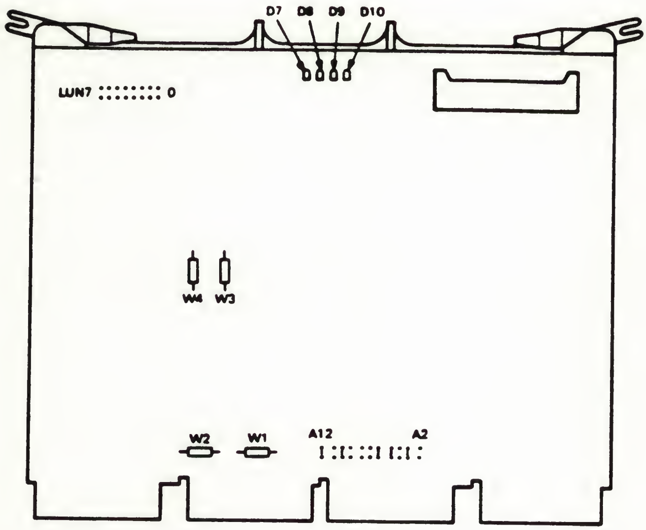
Module Number: M8639-YB

The RQDX2 controller is used to interface fixed-disk drives and diskette drives to the Q22-bus. It is an intelligent controller with on-board microprocessors. Data is transferred using DMA. Programs in the host system communicate with the controller and drives using the Mass Storage Control Protocol (MSCP).

The RQDX2 can control a maximum of four drives. Each fixed-disk counts as one drive. Each RX50 counts as two drives.

Figure 3-21 shows the jumper and LED locations for the RQDX controllers.

Figure 3-21 RQDX2 Module Layout



The CSR address of the first RQDX2 is fixed. Table 3-19 lists the factory setting and common settings for a second RQDX2. If a second RQDX2 is installed, its CSR address will float.

Table 3-19 RQDX2 CSR Address

Module number	Starting address	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	<-Add. bits (jumpers)
1	17772150	1	0	1	0	0	0	1	1	0	1	0	<- factory

possible settings for second RQDX:

17760334	0	0	1	1	0	1	1	1	0	0	0
17760354	0	0	1	1	1	0	1	1	0	0	0
17760374	0	0	1	1	1	1	1	1	0	0	0

1 = installed 0 = removed

The interrupt vector for the RQDX2 is set under program control. The first RQDX2 is assigned a fixed interrupt vector of 154. If a second RQDX2 is installed, its interrupt vector will float.

NOTE

The first MSCP device in a system is assigned a CSR address of 17772150. If more than one MSCP device is installed, the CSR address of the second device must be set within the floating range. See section 4.1.5 to determine the floating CSR address.

In addition to the CSR address and interrupt vector, Logical Unit Number (LUN) jumpers (0 - 7) on the module must be configured. When the RQDX2 is shipped, all of the LUN jumpers are removed. This is the correct configuration for the first RQDX2 module in a system and will assign LUNs 0 - 3 to the module. If a second RQDX2 module is added, a jumper should be installed onto pin 2, to assign its LUNs to the values 4 - 7. The jumpers represent a binary weighted value and can thus be configured to begin at any LUN from 0 to 35, as shown in table 3-20:

Table 3-20 RQDX2 LUN Jumpers

LUN Jumper:	5	4	3	2	1	0
Binary weighted value:	32	16	8	4	2	1
1st LUN assigned: 0	all jumpers out (factory setting)					
1						in
2					in	
3					in	in
4				in		
5				in		in
etc.						
35	in				in	in

For further information, refer to the RQDX2 Controller Module User's Guide (EK-RQDX2-UG).

3.3.2 RD52, RD53 Disk Drives

Order: RD5nA-BA (disk kit) n = 2 or 3

An RD5nA-BA kit includes the following:

1. RD5n-A   : disk drive
2. 17-00282-01 : 20-pin cable to signal distribution board
3. 17-00286-01 : 34-pin cable to signal distribution board
4. 70-22393-01 : Control panel assembly

The RD52 and RD53 are fixed-disk drives with formatted storage capacities of 31 and 71-Mbytes, respectively.

In addition to the cables listed above, a cable from the power supply must be connected to each RD drive in the system (see chapter 1, section 1.6.1).

3.3.2.1 Factory Configuration

The RD52 read/write printed circuit board (PCB) has five pairs of drive select pins (figure 3-22). One (any one) of the four pairs of pins on the left must be connected with a jumper. The RD53 read/write PCB has four drive select switches at the rear of the drive's read/write board. One (any one) of the four switches must be depressed.

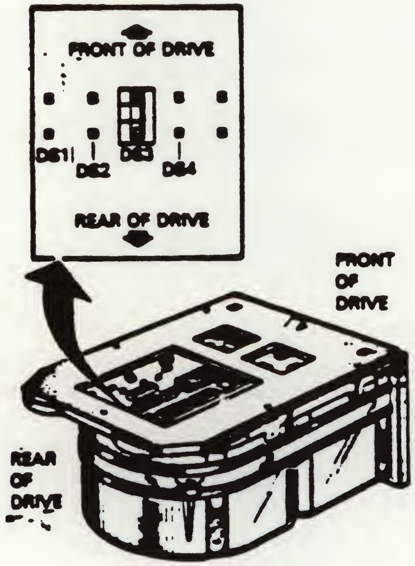
In the BA123-A enclosure, a drive is selected by the position of its signal cables in the M9058 signal distribution board, not by the drive select pins. See figure 1-7 for the correct cabling.

If an RD5n drive is added to the system, it must be formatted. The formatting utility is available in the maintenance version of the MicroVAX II Diagnostics Kit.

For further information, refer to:

* RD52-D, -R Fixed Disk Drive Subsystem Owner's Manual (EK-LEP04-OM-001)
* 113-UC/11C23-UE RD52 Upgrade Installation Guide

Figure 3-22 RD52 Disk Drive and Shunt Jumper



3.3.3 RX50 Diskette Drive

Order: RX50A-BA

The RX50A-BA kit includes the following:

RX50-AA	: diskette drive
17-00867-01	: 34-pin cable RX50 to signal dist. board

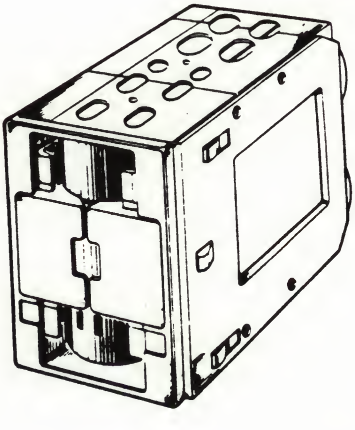
The RX50 (figure 3-23) is a random-access, dual-diskette storage device that uses two single-sided 5 1/4" RX50K diskettes. It has a total formatted capacity of 818 Kbytes (409 per diskette). The RX50 has two access doors and slots for diskette insertion. A light next to each slot indicates when the system is reading or writing to the diskette in that slot.

The RX50 is installed in mass-storage shelf 5. A cable connects the RX50 to the power supply.

NOTE

Only one RX50 drive can be used with one RQDX2 controller module.

Figure 3-23 RX50 Diskette Drive



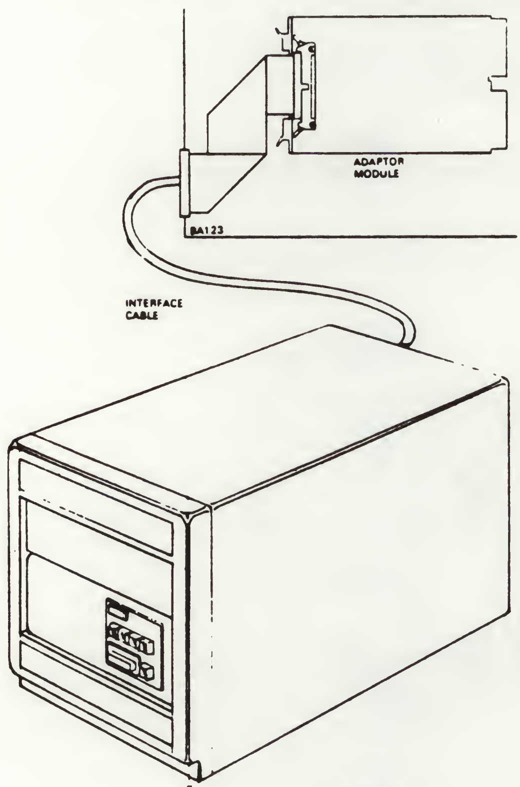
3.3.4 RC25 Disk Subsystem

Order: RC25-DA (-DB) (table-top RC25 and cartridge)
-DA = 120v, -DB = 240v line cord

KLESI-QA (controller module, cables)

The RC25 is a stand-alone mass-storage disk subsystem (figure 3-24) with a capacity of 52 Mbytes. It contains two 8-inch, double-sided disks, each with a capacity of 26 Mbytes. One disk is fixed and one is removable. Both disks are mounted on and driven by the same spindle.

Figure 3-24 RC25 Disk Subsystem



The CSR address of the M7740 controller module is configured using a DIP switch, E58 (figure 3-25). Table 3-21 lists the factory setting. The interrupt vector is set under program control.

Table 3-21 M7740 CSR Address

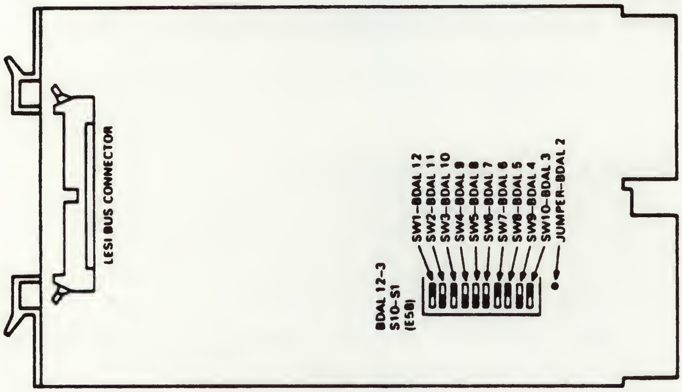
Address	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2<- Add. bits
	<----------			E44 Switches						---------->	Jumper
	1	2	3	4	5	6	7	8	9	10	
17772150	1	0	1	0	0	0	1	1	0	1	0*
possible addresses if second MSCP device:											
17760334	0	0	0	0	0	1	1	0	1	1	1**
17760354	0	0	0	0	0	1	1	1	0	1	1

1 = switch on   0 = switch off
* 0 = jumper on left and center pin (module edge towards you)
** 1 = jumper on right and center pin

NOTE

The M7740 and the M8639-YB (RQDX2 controller) are both MSCP devices. The first MSCP device in a system is assigned a CSR address of 17772150. If more than one MSCP device is installed in the same system, the CSR address of the second device must be set within the floating range.

Figure 3-25 M7740 Module Layout



3.4.2 TK50 Tape Drive Subsystem

Order: TK50-AA (tape drive and cartridge)
TQK50-BA (controller module and signal cable)

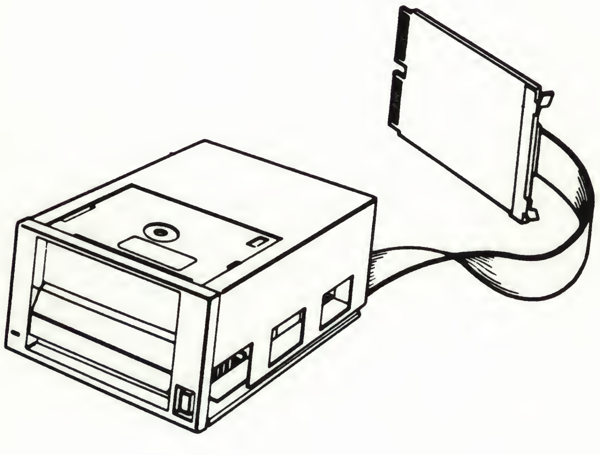
NOTE: Both parts must be ordered for a complete sub-system.

The TK50 is a streaming tape drive subsystem that provides 95 Mbytes of backup data storage. The media used are magnetic tape cartridges.

The TK50 tape drive subsystem (figure 3-26) consists of two major components:

* the TK50-AA tape drive and cartridge, installed in enclosure shelf five
* the TQK50-BA (M7546) controller module and 30" signal cable

Figure 3-26 TK50 Tape Drive Subsystem



The M7546 controller module provides the interface between the TK50-AA tape drive and the Q22-bus. The signal cable connects the module to the drive.

Figure 3-27 shows the location of two DIP switches on the controller module, which are used to configure the following:

* hardware revision level (set at the factory)
* unit number

The hardware revision level DIP switch is set to match the module revision level, which is stamped on the back of the module. Check the revision level stamped on the module with the switch settings. The eight switches in this DIP switch represent a binary weighted value, as shown in table 3-22:

Table 3-22 Revision Level Switch Settings

Revision Level	Switches 1	2	3 - 8
0	0	0	0 - 0
1 (A)	1	0	0 - 0
2 (B)	0	1	0 - 0
3 (C)	1	1	0 - 0
etc.			

0 = open 1 = closed
switch 8 is nearest module edge

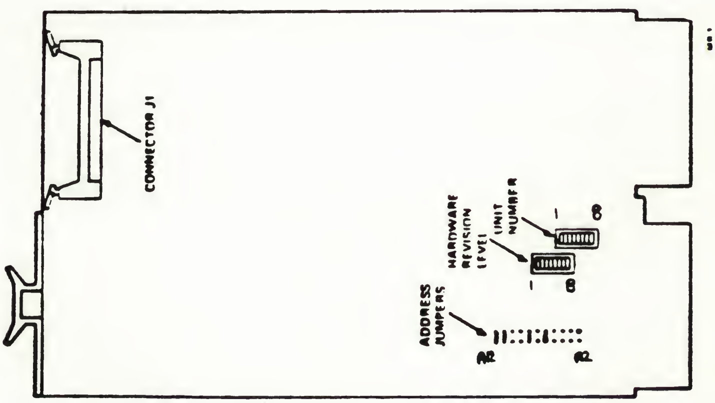
The unit number may be specified using the unit number DIP switch. It is not necessary to change this switch from the factory setting if the MicroVMS operating system is installed. The unit number is set as shown in table 3-23:

Table 3-23 Unit Number Settings

Unit Number	Switches 1	2	3	- 8	
0	0	0	0	- 0	(factory)
1	1	0	0	- 0	
2	0	1	0	- 0	
3	1	1	0	- 0	
etc.					

0 = open 1 = closed
switch 8 is nearest module edge

Figure 3-27 M7546 Module Layout



The CSR address for the first M7546 controller module is fixed at 17774500 and is set using jumpers (figure 3-27). If an additional M7546 controller module is installed, its CSR address will float (see table 4-3). Table 3-21 lists the factory setting for the first M7546 and possible settings for a second M7546.

Table 3-24 M7546 Controller Module CSR Address

CSR Address	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	<- Add. bits (jumpers *)
17774500	1	1	0	0	1	0	1	0	0	0	0	(factory)
Common settings for second M7546 controller:												
17760404	0	0	0	0	1	0	0	0	0	0	1	
17760444	0	0	0	0	1	0	0	1	0	0	1	

1 = jumper installed 0 = jumper removed
* A2 is the jumper nearest the module edge

The interrupt vector is fixed at 260 and is set under program control.

For further information, refer to the TK50 Tape Drive Subsystem Owner's Manual (EK-LEP05-OM).

CHAPTER 4 - CONFIGURATION

4.1 Configuration Rules

There are several factors to consider when configuring a MicroVAX system in a BA123-A enclosure:

1. Module physical priority
2. Backplane and I/O panel expansion space
3. Power requirements
4. Module CSR addresses and interrupt vectors

4.1.1 Module Physical Priority

The order in which options are placed in the backplane affects system performance. Modules should be installed according to the following rules.

* The KA630-A CPU is installed in slot 1.

* MA630-B memory modules are installed in slots 2 and 3.

* The MS630-AA memory module must be placed in the CD rows of slot 2 or 3.

* With the exception of the MS630-AA memory module, dual-height modules installed in slots 1 - 4 must be placed in the AB rows. No grant continuity card is necessary.

NOTE

If slots 2 and 3 (or slot 3) are not used for MS630 memory modules, and are not required for Q22-bus options, it is recommended that they be reserved for future memory expansion with M9047 grant continuity cards in the AB rows.

* Dual-height modules installed in slots 5 - 12 can be located in either the AB or CD rows. The opposite rows must contain either another dual-height module or an M9047 grant continuity card.

The following list shows the recommended sequence of modules:

1. KA630-A CPU

2. Local Memory Modules (no more than two):
   MS630-BB
   MS630-BA
   MS630-AA

3. Q22-bus Memory Modules
   MRV11 M8047

4. Synchronous Communications Modules - No Silos
   DPV11 M8020

5. General Purpose I/O Ports
   DRV11-J M8049

6. Line Printer Interface
   LPV11 M8027

7. Asynchronous Communications Module - No Silos
   DLVJ1 M8043

8. Asynchronous Communications Modules - With Silos
   DZV11 M7957
   DZQ11 M3106

9. Synchronous Communications Modules - DMA
   DMV11-M M8053
   DMV11-N M8064

10. Ethernet Communications Module
    DEQNA M7504

11. Asynchronous Communications Module - With silos/DMA
    DHV11 M3104

12. Streaming Tape Controller (Smart DMA)
    TQK50 M7546

13. Mass Storage Controller (Smart DMA)
    RQDX2 M8639-YB
    KLESI M7740

The relative priority of these options is based on their preferred interrupt and DMA priority. The location of the MRV11 has no effect on interrupt and DMA priorities; its location may be changed to facilitate cable distribution, etc.

4.1.2 Expansion Space

Backplane:

There are twelve backplane slots available for Q-22 bus compatible modules. The configuration examples in this chapter show the slots occupied by modules and the number of open slots remaining.

I/O Panel Insert Space:

There are four type A (1X4) and six type B (2X3) cutouts available on the back panel for mounting I/O panel inserts. The bottom two type B cutouts can be converted to provide three additional type A cutouts. Table 4-1 lists the type of inserts used for each module. The configurator worksheet (figure 4-1) is used to keep track of the number of inserts that have been used.

4.1.3 Power Requirements

The configuration worksheet (figure 4-1) is used to keep track of current at +5v and +12v, and power. The total current drawn and power used by system modules and mass-storage devices in the enclosure must not exceed the following limits, for each regulator:

Current: at +5vdc = 36 amps
+12vdc = 7 amps

Power: 230 watts maximum from each regulator

Table 4-1 lists the current drawn by the Q22-bus options.

4.1.4 Bus Loads

Table 4-1 lists the AC and DC bus loads for Q22-bus modules.

Table 4-1 Power Requirements, Bus Loads, I/O Inserts

Option	Module	Current (amps) +5v	Current (amps) +12v	Power (watts)	Bus Loads AC	Bus Loads DC	I/O Inserts A=1x4,B=2x3
KA630-AA	M7606	6.2	0.14	32.7	2.7	1.0	B
KA630-AB	M7606	5.9	0.14	31.1	2.7	1.0	B
MS630-AA	M7607	1.0	0.0	5.0	-	-	
MS630-BA	M7608	1.3	0.0	6.5	-	-	
MS630-BB	M7608	1.8	0.0	9.0	-	-	
MRV11-AA	M7942	2.8	0.0	14.0	1.8	1.0	
DPV11-DP	M8020	1.2	0.3	9.6	1.0	1.0	A
DRV11-JP	M8049	1.8	0.0	9.0	2.0	1.0	A (2)
DRV11-LP	M7941	0.9	0.0	4.5	2.8	1.0	A (2)
LPV11-XP	M8027	0.8	0.0	4.0	1.4	1.0	A
DLVJ1-LP	M8043	1.0	0.25	8.0	1.0	1.0	B
DZV11-DP	M7957	1.2	0.39	10.7	3.9	1.0	B
DZQ11	M3106	1.0	0.36	9.32	1.5	1.0	B
DMV11-AP	M8053-MA	3.4	0.4	21.8	2.0	1.0	B
DMV11-BP	M8053-MA	3.4	0.4	21.8	2.0	1.0	A
DMV11-CP	M8064-MA	3.4	0.4	21.8	2.0	1.0	B
DMV11-FP	M8053-MA	3.4	0.38	21.56	2.0	1.0	B
DHV11-AP	M3104	4.5	0.55	29.1	2.9	0.5	B (2)
DEQNA-KP	M7504	3.5	0.5	23.5	2.8	0.5	A
RLV12-AP	M8061	5.0	0.10	26.2	2.7	1.0	A
TQK50	M7546	2.9	0.0	14.5	2.0	1.0	
KLESI-QA	M7740	3.0	0.0	15.0	2.3	1.0	A
RQDX2	M8639-YB	6.4	0.1	33.2	2.0	1.0	
RX50-AA		0.85	1.8	25.9	-	-	
RD51-A		1.0	1.6	24.2	-	-	
RD52-A		1.0	2.5	35.0	-	-	
RD53		0.9	2.5	34.5	-	-	
TK50-AA		1.35	2.4	33.55	-	-	

Figure 4-1 Configuration Worksheet

1. Write the module and mass-storage device names in the columns beside the slot and shelf numbers.
2. Refer to table 4-1. Enter the +5v and +12v currents, power and I/O panel insert size for each module and mass-storage device.
3. The column totals must not exceed the limits listed at the bottom.

```
                   -------------------ADD THESE COLUMNS-------------------------
                    V         V         V         V         V         V        V      V

             |-------REGULATOR A-------||-------REGULATOR B-------||I/O INSERTS
             | Current (Amps) | Power  || Current (Amps) | Power  ||(2X3) (1X4)
SLOT  MODULE | +5vdc | +12vdc |(Watts).|| +5vdc | +12vdc |(Watts) ||  B      A
-----|-------|-------|--------|--------||-------|--------|--------||-----|-----
1 AB |       |       |        |        ||*************************||     |
  CD |_______|       |        |        ||*************************||_____|_____
2 AB |       |*************************||       |        |        ||     |
  CD |_______|*************************||       |        |        ||_____|_____
3 AB |       |       |        |        ||*************************||     |
  CD |_______|       |        |        ||*************************||_____|_____
4 AB |       |*************************||       |        |        ||     |
  CD |_______|*************************||       |        |        ||_____|_____
5 AB |       |       |        |        ||*************************||     |
  CD |_______|       |        |        ||*************************||_____|_____
6 AB |       |*************************||       |        |        ||     |
  CD |_______|*************************||       |        |        ||_____|_____
7 AB |       |       |        |        ||*************************||     |
  CD |_______|       |        |        ||*************************||_____|_____
8 AB |       |*************************||       |        |        ||     |
  CD |_______|*************************||       |        |        ||_____|_____
9 AB |       |       |        |        ||*************************||     |
  CD |_______|       |        |        ||*************************||_____|_____
10AB |       |*************************||       |        |        ||     |
  CD |_______|*************************||       |        |        ||_____|_____
11AB |       |       |        |        ||*************************||     |
  CD |_______|       |        |        ||*************************||_____|_____
12AB |       |*************************||       |        |        ||     |
  CD |_______|*************************||       |        |        ||_____|_____
13AB |       |       |        |        ||*************************||  |     |
  CD |signal |  .52  |        |  2.60  ||*************************||  |     |
     |dist.  |-------|--------|--------||-------|--------|--------||  |     |
-------------|   |   |    |   |   |    ||   |   |    |   |   |    ||  |     |
MASS-STORAGE |   |   |    |   |   |    ||   |   |    |   |   |    ||  |     |
SHELF| DEVICE|   V   |    V   |   V    ||   V   |    V   |   V    ||  |     |
5*   |       |       |        |        ||*************************||  |     |
   4 |       |       |        |        ||*************************||  |     |
   3 |       |       |        |        ||*************************||  |     |
   2 |       |*************************||       |        |        ||  |     |
   1 |       |*************************||_______|________|________||  |     |
--------------   |        |        |        |        |        |       |     |
                 V        V        V        V        V        V       V     V

TOTAL THESE
COLUMNS:        ___      ___      ___      ___      ___      ___     ___   ___

MUST NOT
EXCEED:         36a      7a       230w     36a      7a       230w     6    4**
--------------------------------------------------------------------------------
```

* Shelf 5 is on the upper left side. Shelf 1 is on the lower right side.
** If more than 4 1X4 I/O panels are required, the adapter template may be used.

4.1.5 Module CSR Addresses / Interrupt Vectors

Modules must be set to the correct CSR address and interrupt vector. Use table 4-2 to determine the correct settings. The following rules must be observed:

1. Check off all the options that will be installed in the system.

2. If there is an F in the vector column, the device has a floating vector. Assign a vector to each option checked, starting at 300 and continuing in the following sequence:

   300, 310, 320, 330, 340, 350, 360, 370

3. If there is an F in the address column, the device has a floating CSR address. Use table 4-3 to determine the correct addresses for these devices. If a module has a floating vector and CSR address, additional modules of the same type will also have a floating vector and CSR address.

Table 4-2 Address/Vector Worksheet

Option	Module	Unit No.	Check if in System	Vector	CSR Address (N=177)
KA630-A	M7606	---	---	---	---
MS630-A	M760x	---	---	---	---
DPV11	M8020	1		F	F
DRV11-JP	M8049	1		F	N64120
DRV11-JP	M8049	2		F	N64140
LPV11	M8027	1		200	N77514
DLVJ1	M8043	1		F *	N76500
DLVJ1	M8043	2		F	N76510
DZV11	M7957	1		F	F
DZQ11	M3106	1		F	F
DHV11	M3104	1		F	F
DEQNA	M7504	1		120	N74440
DMV11	M8053	1		F	F
DMV11-CP	M8064	1		F	F
TQK25	M7605	1		224	N72520
TQK50	M7546	1		260	N74500
KLESI-QA	M7740	1		154	N72150
RQDX2	M8639	1		154	N72150

* The DLVJ1 vector can only be configured at 300, 340, 400, 440 etc. If the first available floating vector is 310 (or 320, 330), the DLVJ1 should be set to 340 and the next device set to 400.

4.1.5.1 Floating CSR Addresses

Table 4-3 lists the floating CSR addresses for common combinations of devices that will require configuration.

Table 4-3 Floating CSR Addresses

* = Device may be installed or not

Go DOWN through the columns in the table to find the column that matches your configuration.

Any device added to or removed from the list will not effect the addresses of devices above it.

Device	Substitute the numbers below for the nnn in 17760nnn								
DZQ/V 1				100	100	100	100	100	100
DZQ/V 2				* 110	* 110	110	* 110	110	* 110
DZQ/V 3				* 120		120		120	
DPV11	* 270	* 270	* 270		* 310	* 330	* 310	* 330	* 310
DMV11			320				340	360	340
2nd MSCP		334	* 354		* 354	374	374	* 414	
2nd TK50	* 404	* 444	* 444	* 444		* 504	* 504	504	* 444
DHV11 1	440	500	500	500	500	540	540		500
DHV11 2	460	520	520	520	520				520

4.2 Configuration Examples

The BA123-A enclosure can be used in a variety of configurations. Figure 4-2 shows possible module utilizations for MicroVAX systems.

NOTE

Refer to figure 1-9 to review the bus grant continuity before configuring a system.

Figure 4-2 Module Utilizations

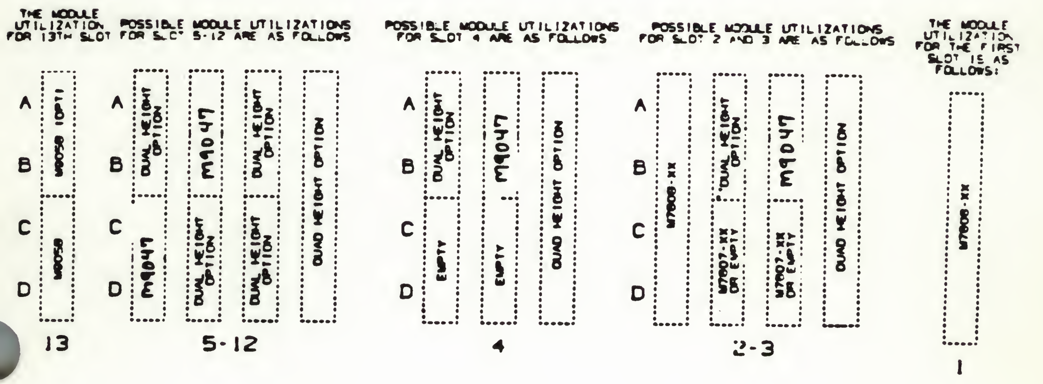


Table 4-4 shows the backplane set-up for a base system, which can be expanded at a later time.

Table 4-4 Base System

Mass storage device: RX50
RD52

Backplane slot#	Row A B	Row C D	I/O cutouts (standard I/O) (1X4) 4	(2X3) 6
1	KA630-AB (quad) cpu			1
2	M9047 grant card	MS630-AA memory		
3	M9047 grant card	Empty		
4	DHV11 (quad) 8 line multiplexer			2
5	RQDX2 (quad) rd/rx controller			
6				
7				
8				
9				
10				
11				
12				
		total used :	0	3
		available :	4	3

Table 4-4 shows the expandability of a MicroVAX system in the BA123-A enclosure. It includes the following features:

* 9 Mbytes of main memory
* 2 RD53 fixed-disk drives, providing 142 Mbytes of mass-storage
* 2 eight-line asynchronous multiplexers, providing ports for 16 terminals
* a DEQNA module to connect to Ethernet
* a DPV11 module to connect to a modem
* an LPV11 module for an LP25 printer
* a TK50-AA tape drive for system loading and backup

Table 4-5 Advanced System

Mass storage devices: RX50
RD53
RD53
Backup device: TK50-AA

Backplane slot #	Backplane Row A	B	C	D	I/O cutouts (standard I/O) (1X4) 4	(2X3) 6
1	KA630-AA quad cpu, 1Mbyte mem. + FPP					1
2	MS630-BB (quad) 4 Mbyte memory					
3	MS630-BB (quad) 4 Mbyte memory					
4	DPV11 com (dual)		Empty		1	
5	LPV11 prt (dual)		DEQNA net (dual)		2	
6	DHV11 (quad) 8 line mux.					2
7	DHV11 (quad) 8 line mux.					2
8	M9047 grant card		TQK50 cont. (dual)			
9	RQDX2 (quad) rd/rx controller					
10						
11						
12						
				total used :	3	5
				available :	1	1

CHAPTER 5--DIAGNOSTICS

5.1 Introduction

This chapter performs two basic functions. It provides:

1. An overview of the diagnostic and maintenance tools available for use with the MicroVAX II.

2. A roadmap for the diagnosis and repair of failures.

5.2 KA630 Boot and Diagnostic ROM

The MicroVAX II boot and diagnostic ROM tests the basic functionality of the KA630 module. Testing can occur in either of two modes:

--Power-up Mode

--Console I/O Mode

5.2.1 Power-up Mode

In power-up mode, the ROM diagnostics, in conjunction with the boot programs, test the KA630 module's ability to load and run an operating system, the MicroVAX Maintenance System, or other diagnostic software.

Table 5-1 provides a description of each test located in the ROM diagnostic, and the LED value displayed on the MicroVAX II CPU I/O distribution insert while each test is being run. The LED value is also displayed in binary form by a series of red LEDs on the KA630-A module (Figure 5-1), and, for values of 8 or less, on the console terminal. Table 5-1 also lists the probable field replaceable units (FRUs) for each particular nonzero value.

Table 5-1. LED Status and Error Messages.

LED	ERROR MESSAGE/PROBABLE FRU FAILURES
F	WAITING FOR DCOK 1. KA630-A module (does not recognize DC OK assertion) 2. Power supply (negating DC OK on bus) 3. A Q22-bus device (negating DC OK on bus) 4. Backplane (DC OK shorted to another signal) 5. Power supply cable (defective or not properly connected)
E	WAITING FOR POK 1. KA630-A module (does not recognize P OK assertion) 2. Power supply (negating P OK on bus) 3. A Q22-bus device (negating P OK on bus) 4. Backplane (P OK shorted to another signal)
D	RUNNING CHECKSUM TEST ON CPU ROM 1. KA630-A module
C	SEARCHING FOR RAM MEMORY REQUIRED FOR CPU ROM PROGRAMS 1. KA630-A module 2. MS630 module(s) 3. KA630-A/MS630 interconnect cable (short- or open circuited)
B	READ KA630-A IPCR REGISTER (accesses Q22-bus) 1. KA630-A module 2. A Q22-bus device (preventing the CPU from acquiring the bus) 3. Backplane (preventing the CPU from acquiring the bus)

A TESTING VCB01 VIDEO CONSOLE DISPLAY (if present)

1. Keyboard for VCB01 (defective or not connected)
2. Video display for VCB01 (defective or not connected)
3. VCB01 module
4. KA630-A module (can't read or write Q22 bus; may be shorting Q22-bus)
5. A Q22-bus device (preventing the CPU from acquiring the bus)
6. Backplane (preventing the CPU from acquiring the bus)
7. VCB01 distribution insert

9 IDENTIFYING CONSOLE TERMINAL

1. KA630-A module (if console does not respond within 6 seconds, CPU will proceed to 7)

8 LANGUAGE INQUIRY OR CPU HALTED

NOTE: When the LED is stopped at 8, the system is either: A) preparing to ask the user to supply the selected language to be used, B) informing the user that the CPU is halted or C) actually indicating a failure. If the system is not indicating a halt, but waiting for a language to be entered, it will time out and continue testing within 2 to 6 minutes.

NOTE: Before the console reaches 8, a heading should appear which reports the version of CPU installed in the system, as well as other system information. If the LED reaches 8 or less and the

console terminal doesn't display a heading, the following problems should be suspected:

1. KA630-A module (probably console interface)
2. Console cables (defective or not connected)
3. Console baud rate (mismatched)
4. Console terminal (powered off)
5. Console terminal (broken)
6. Console distribution insert

7 RUNNING DATA TESTS ON RAM MEMORY

1. KA630-A module (RAM memory failure)
2. MS630 module
3. Backplane (CD interconnect short- or open-circuited)
4. KA630-A/MS630 interconnect cable short- or open-circuited)

6 RUNNING ADDRESS TESTS ON RAM MEMORY

1. MS630 module
2. Backplane (CD interconnect short- or open-circuited)
3. KA630-A/MS630 interconnect cable short- or open-circuited)

5 RUNNING TESTS THAT USE Q22-BUS MAP TO ACCESS LOCAL MEMORY

1. KA630-A module
2. Q22-bus device (preventing the CPU from acquiring the bus)
3. Backplane (preventing the CPU from acquiring the bus)

4 CPU INSTRUCTION AND REGISTER TESTS

1. KA630-A module

3 RUNNING INTERRUPT TESTS

1. KA630-A module
2. Q22-bus device (incorrectly requesting interrupt)
3. Backplane (Q22-bus BR line shorted)

2 SEARCHING FOR BOOTSTRAP DEVICE

NOTE: Be sure to try the remedies in the Troubleshooting section of the Owner's Manual before exploring these possibilities.

NOTE: Please check signal and power cables before assuming drives or controllers to be defective. Once cables have been checked, examine power-up LEDs on individual devices and refer to Section 5-3.

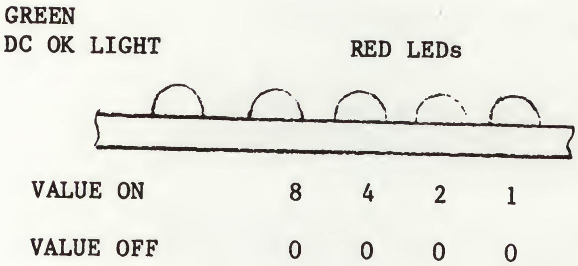
1. RQDX controller, RD5n drive, RX50 drive, or interconnect cable defective or not properly connected.
2. TQK50 controller, TK50 drive, or interconnect cable defective or not properly connected.
3. MRV11D module
4. DEQNA module
5. KA630-A module

1 BOOTSTRAP DEVICE FOUND

1. Q22-bus bootstrap device
2. Signal cable to bootstrap device (defective or not connected)
3. Power cable to bootstrap device (defective or not connected)
4. KA630-A module

0 TESTING COMPLETED

Figure 5-1. LEDs on the KA630-A CPU module



The the sum of values of all LEDs ON (when translated to hexadecimal) corresponds to the hexadecimal values listed in Table 5-1.

5.2.2 Console Mode

In the Console I/O mode, one of the ROM tests may be selected using the TEST command. In addition, the EXAMINE command lets the user EXAMINE the contents of registers and memory, and the BOOT command, when combined with the appropriate qualifier, selects the boot device. Further details on console commands are given in Appendix A.

Console Terminal Error Messages

Error messages reported on the console terminal are formatted as shown in Figure 5-2.

```
1.   KA630-A.XX

2.   Performing normal system tests.

3.   7..

4.   ? <subtest>  <p1> <p2> <p3>

5.   Failure.
     Normal operation not possible.
```

Figure 5-2. Example of a console terminal error message.

1. Identifies the processor and the version number of the console program ROM.

2. Explains that the system is performing normal system tests as programmed on the ROM.

3. Begins a countdown sequence to show that the system is progressing through its tests. The numbers displayed have the same meaning as the numbers displayed on the rear I/O panel insert.

4. Indicates that the countdown sequence has been interrupted. Displays a diagnostic message which includes the question mark, a subtest code number and up to three parameters. A list of console error messages, and their explanations, is given in Appendix B.

5. Indicates that the test has failed and that the console program has stopped executing.

5.3 Power-up LEDs on Mass Storage, Backup, and Communications Devices

Several of the supported options (modules) for MicroVAX II have LEDs which provide information on device-level power-up testing. Figures 5-3 through 5-5 show the orientation of LEDs on these modules, and Tables 5-2 through 5-4 explaining the definitions of possible LED readings, and the likely field replaceable units (FRUs).

Figure 5-3 LED orientation on the DEQNA module

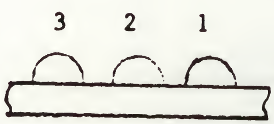


Table 5-2 DEQNA Module LED indications

LEDS 3	2	1	DEFINITION/FRU
ON	ON	ON	Performing DEQNA Station Address PROM test 1. DEQNA module 2. KA630 module 3. Q22-bus device 4. Backplane

ON	ON	OFF	Performing DEQNA internal loopback test 1. DEQNA module
ON	OFF	OFF	Performing DEQNA external loopback test 1. DEQNA module 2. Cabling (shorted, opened, or not connected) 3. Fuse in distribution insert
OFF	OFF	OFF	The DEQNA passed all power-up tests.

+--+

Figure 5-4 LED orientation on the RQDX2 module

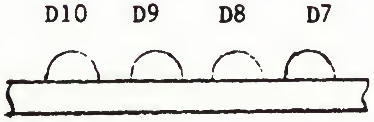


Table 5-3 RQDX2 Module LED Indications

D10	D9	D8	D7	Definition/FRU
ON	ON	ON	ON	Beginning power-up testing 1. RQDX2 Module
OFF	OFF	OFF	ON	Performing T11 processor test 1. RQDX2 Module
OFF	OFF	ON	OFF	Performing T11 timer/counter/ address generator test 1. RQDX2 Module
OFF	OFF	ON	ON	Performing Q22-bus timer/ counter/ address generator test 1. RQDX2 Module
OFF	ON	OFF	OFF	Performing Serializer/ Deserializer test 1. RQDX2 Module
OFF	ON	OFF	ON	Performing CRC generator test 1. RQDX2 Module
OFF	ON	ON	OFF	Performing hardware version test 1. RQDX2 Module

OFF	ON	ON	ON	Performing ROM checksum test
				1. RQDX2 Module
ON	OFF	OFF	OFF	Performing RAM test
				1. RQDX2 Module
ON	OFF	OFF	ON	Performing diagnostic interrupt test
				1. RQDX2 Module
ON	OFF	ON	OFF	Performing shuffle oscillator test
				1. RQDX2 Module
ON	OFF	ON	ON	Performing valid configuration test
				1. RQDX2 Module
ON	ON	OFF	OFF	NOT USED
ON	ON	OFF	ON	NOT USED
ON	ON	ON	OFF	NOT USED
OFF	OFF	OFF	OFF	Testing completed

Figure 5-5 LED orientation on the TK50 module

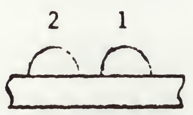


Table 5-4 TK50 Module LED Indications

LEDs 2	LEDs 1	Definition
ON THEN OFF	OFF	Module/drive interaction test fails 1. TQK50 module 2. TK50 drive 3. Interconnect cable
OFF	ON	TQK50 module failed power-up test 1. TQK50 module
OFF	OFF	Module power-up test and module/drive interaction tests both failed 1. TQK50 module 2. TK50 drive 3. Interconnect cable
ON THEN OFF	ON	Module and drive working properly

Several supported options for the MicroVAX II system have a single LED which indicates proper operation of that option. Those options include:

DRV11 (on indicates proper operation)
DHV11 (on indicates proper operation)

5.4 MicroVAX Maintenance System

The MicroVAX Maintenance System (MMS) is a combination diagnostic/maintenance operating system. The system is available in two versions: 1) The installation version, provided with each MicroVAX II and 2) The service version, shipped with the MicroVAX II Maintenance kit. The installation version is documented here, while the service version is documented in the MicroVAX II System Maintenance Guide. The installation version provides:

-- Configuration verification

-- System level testing

MMS is menu driven, and can be loaded into any MicroVAX II system via tape or diskette. Figure 5-6 shows the menu tree which provides access to the various functions on the MicroVAX Maintenance System.

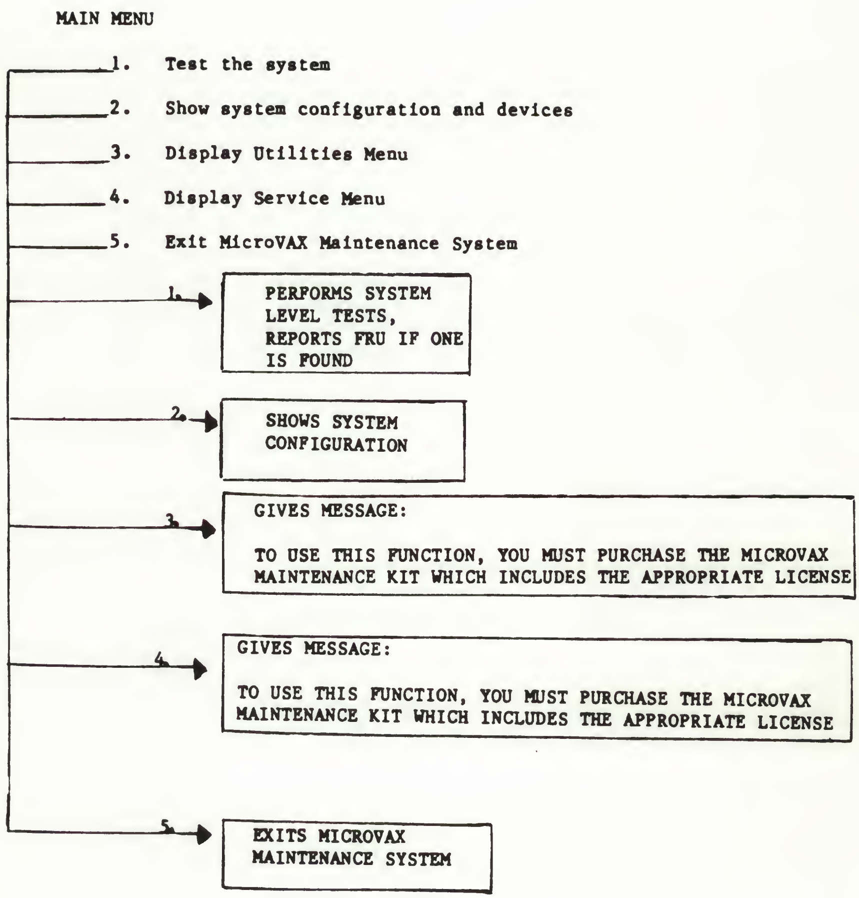


FIGURE 5-6. The Menu Tree for the MicroVAX Maintenance System.

5.4.1 Configuration Verification (menu item #1)

MMS provides verification of system installation by determining and displaying recognized system configuration. A problem or incorrect installation is evident when any device known to be physically installed is missing from the terminal display.

5.4.2 System Tests (menu item #2)

System level functional and exerciser tests are run by MMS. System level tests are run on all recognized devices, and can be run by any user at any time, without jeopardizing data.

5.5 Troubleshooting

When the MicroVAX II system or a supported option fails or exhibits erratic behavior, one of several tools may be used to help diagnose the problem. The primary tools used to troubleshoot the MicroVAX II system are:

--Front panel indicators and lights

--Power-up self-tests

--The MicroVAX II Owner's Manual

--The MicroVAX II System Technical Manual (this manual)

--MicroVAX Maintenance System--installation version

--The MicroVAX II System Maintenance Guide

--MicroVAX Maintenance System--service version

> NOTE: Before using the Troubleshooting section of this manual, please read the problem/solution section of the Owner's Manual.

Most problems exhibited by a MicroVAX II system will fall under one of the following categories:

--Unknown system level problems (system fails to boot)

--Suspected device level problems (system can boot, problem may be intermittent).

CPU problems

Memory problems

Mass storage problems

Communications problems

The following sections give a suggested method of troubleshooting each family of problems.

5.5.1 Unknown System Level Problems (system fails to boot)

Figure 5-7 outlines the general procedure for troubleshooting the system when either an operating system or the MicroVAX Maintenance System fails to boot.

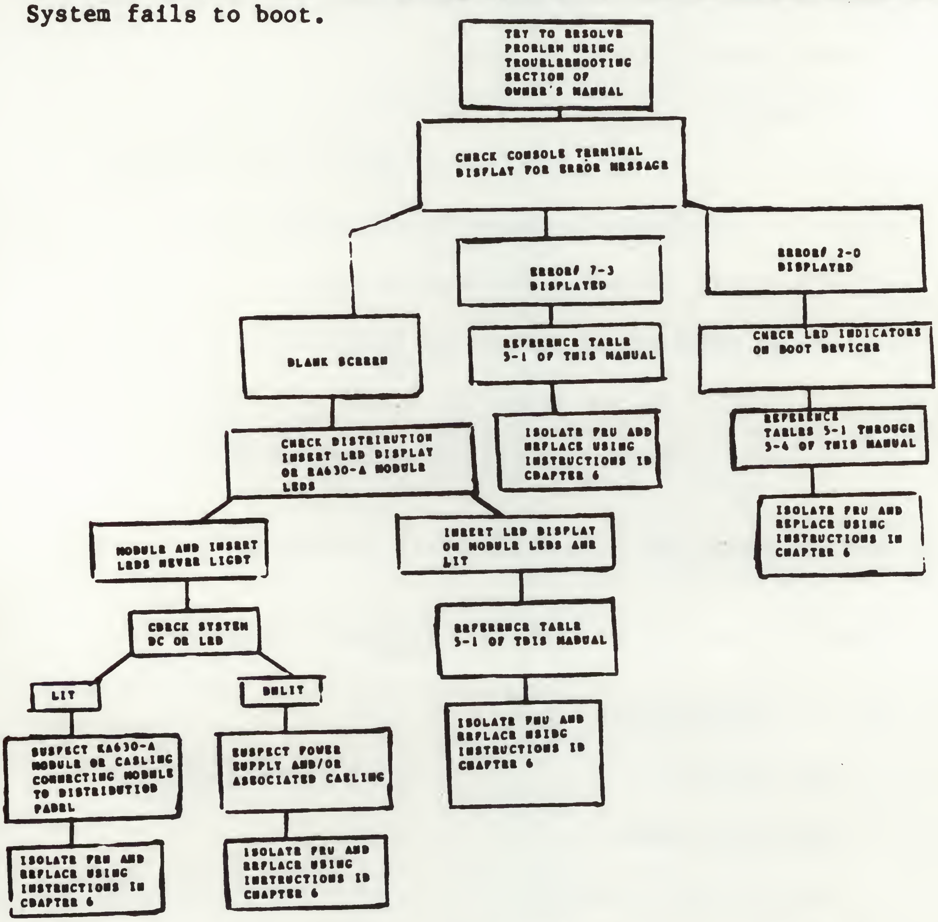


Figure 5-7. Troubleshooting flow for fail-to-boot problems.

1. Monitor the console terminal to determine where in the power-up self-test the system is failing. If the console remains blank, check the LED on the CPU I/O distribution insert, and consult Table 5.1 of this manual to determine the cause of the problem and the suspected FRU. If the LED also remains blank, check the front panel LED on the system, and continue as shown in Figure 5-4 to determine the cause of the problem and probable FRU.

   A. The LED has run through power-up tests--the I/O distribution insert may have been indavertently left in the loopback mode, causing the console to be bypassed.

   B. The LED has stopped at a value other than F--the console or the cable which connects the console to the I/O distribution panel is probably faulty.

   C. The LED also stops at a value of F--the CPU, the I/O distribution insert, or the cable which connects the insert to the CPU is probably faulty.

   D. The LED also remains blank--check the front panel on the system, and continue as shown in Figure 5-7 to determine the cause of the problem and the probable FRU.

2. If the console stops between 7 and 3, use the console information, combined with the information in Section 5.2 to determine the cause of the problem and the suspected FRU.

3. If the console stops between 2 and 0, use the console information and the LED indicators on individual module, combined with the information in Sections 5.2 and 5.3 to determine the cause of the problem and the suspected FRU.

5.5.2 Device-Specific Problems

Figure 5-8 outlines the general troubleshooting procedure when the system can boot the MicroVAX Maintenance System, but a problem with a specific device is suspected.

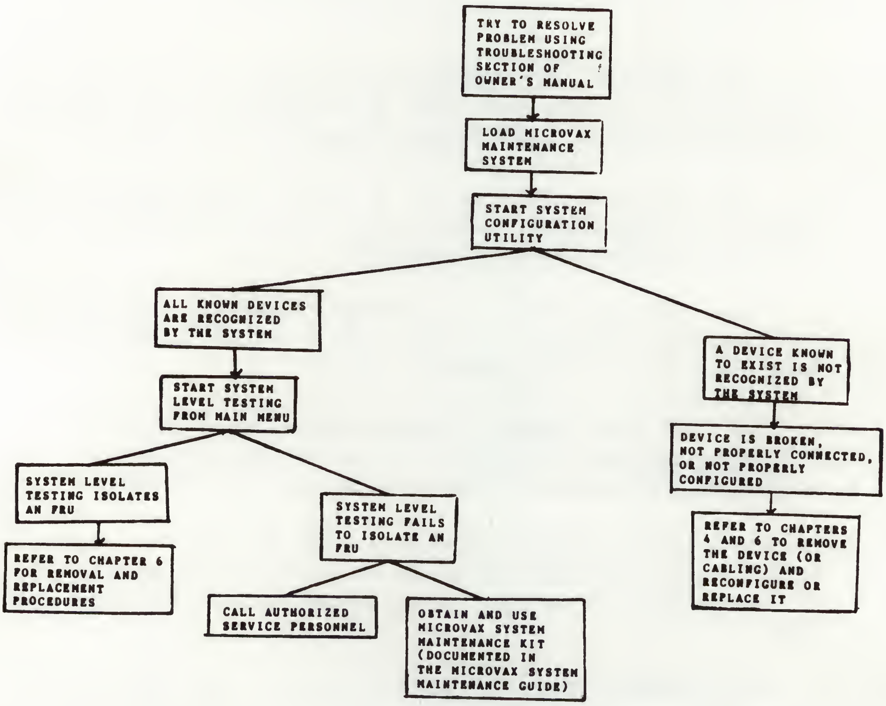


Figure 5-8. Troubleshooting flow for Device-Specific problems.

1. Boot the MicroVAX Maintenance System.

2. Run the configuration procedure available from the Main Menu. Check to make sure that all devices known to be in your system appear on the screen. If a device known to exist does not appear on the display:

   A. It is improperly connected or is broken--refer to Chapter 6 for removal and replacement information.

   B. It is configured to the wrong address--refer to Chapter 6 for removal and replacement information, and refer to Section 4.1.5 for configuration instructions.

3. Run the system level tests available from the Main Menu. After approximately 6 minutes or less, the screen should display the results of testing. Once the testing has begun, one of three cases should occur:

   A. The test locates a suspected FRU--refer to Chapter 6 of this manual for removal and installation of the FRU.

   B. The test fails, but does not locate a suspected FRU--look at device LEDs and refer to Section 5.3, contact authorized service personnel, or refer to the MicroVAX II System Maintenance Guide.

   C. The system passes but you still suspect a problem--look at device LEDs and refer to Section 5.3, contact authorized service personnel, or refer to the MicroVAX II System Maintenance Guide.

CHAPTER 6 - FRU REMOVAL AND REPLACEMENT PROCEDURES

6.1 Introduction

This chapter describes the removal and replacement procedures for the field replaceable units (FRUs) in the BA123-A enclosure (table 6-1, figure 6-1a).

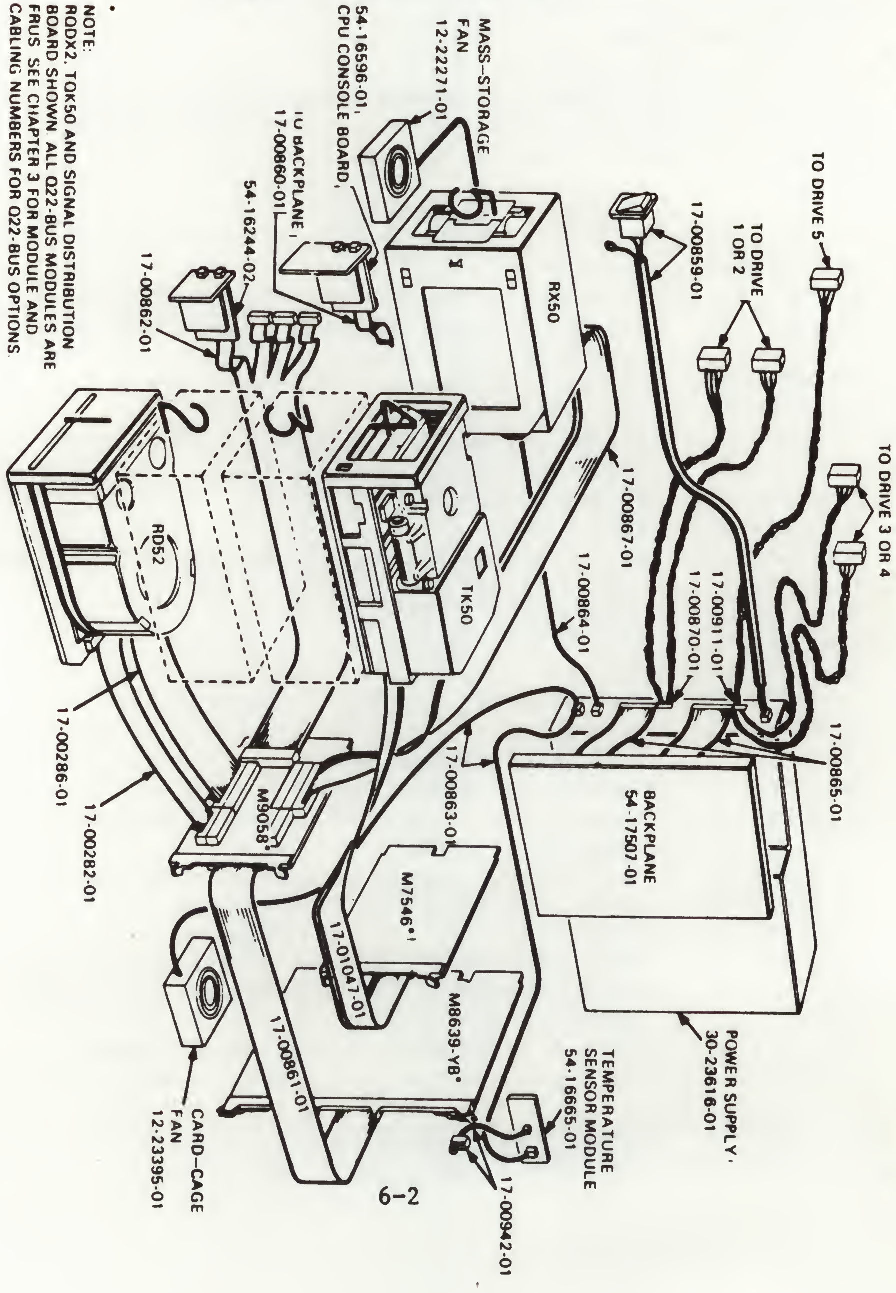
Table 6-1 BA123-A FRUs

Part Number	Description
17-00859-01	switch, AC power to power supply, and cable from switch to power supply
17-00860-01	cable, backplane to CPU console board
54-16596-01	CPU console board
17-00862-01	cable, signal dist. board to 4 RD consoles
17-00282-01	cable, 20 conductor, RD drive
17-00286-01	cable, 40 conductor RD drive
54-16244-02	RD52 console
17-00861-01	cable, 50 conductor, RQDX to signal dist. board
17-00867-01	cable, signal dist. board to RX50
70-22300-01	cable, TK50-A/TQK50 interconnect
54-16674-01	signal distribution board (M9058)
12-23395-01	fan, 12.7 cm, 5 inch (card-cage)
12-22271-01	fan, 11.4 cm, 4.5 inch (mass-storage)
17-00942-01	switch, door interlock, and cable from switch to temperature sensor board
54-16665-01	temperature sensor board
17-00863-01	cable, power supply to card-cage fan and temperature sensor
17-00864-01	cable, power supply to mass-storage fan
17-00865-01	cable, regulator "A" to backplane
17-00865-01	cable, regulator "B" to backplane
17-00870-01	cable, regulator "A" to 2 drives via 2 plugs
17-00911-01	cable, regulator "B" to 3 drives via 3 plugs
30-23616-01	power supply
70-22019-00	Q22-bus backplane, 13 slot, quad-height

NOTE

Unless otherwise specified, FRUs are replaced by reversing the order of the removal procedures.

Figure 6-1a BA123-A FRUs



6.2 Removal of the Exterior Panels

The exterior panels must be taken off before beginning most removal and replacement procedures. The following two sequences will be referenced in the procedures that follow.

6.2.1 Removal of the Right Side Panel

1. Turn the system OFF and unplug the AC power cord from the wall socket.

2. Open the rear door.

3. Loosen the captive screw that connects the right side panel to the rear of the enclosure frame (figure 6-1).

4. The panel is attached to the bottom of the enclosure frame by two snap fasteners. Pull the bottom of the panel out until the panel detaches from the bottom of the enclosure.

5. Lift the panel slightly to release it from the lip at the top of the frame and remove the panel (figure 6-2).

Figure 6-1 Unhooking the Right Side Panel

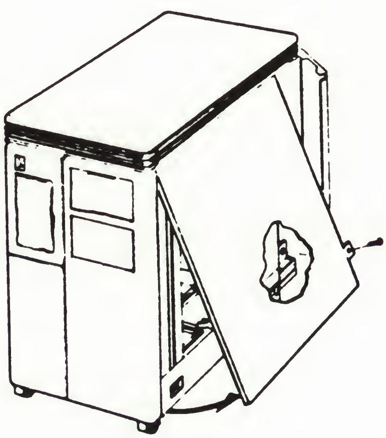
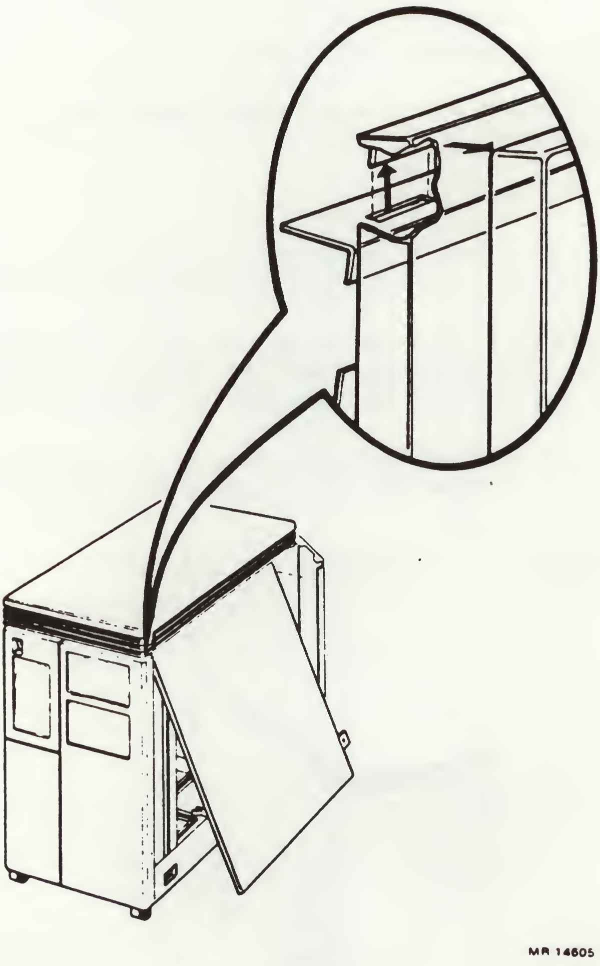


Figure 6-2 Removing the Right Side Panel



6.2.2 Removal of the Left Side Panel

1. Turn the system OFF and unplug the AC power cord from the wall socket.

2. Open the control panel door.

3. Loosen the screw that connects the left side panel to the front of the enclosure frame (figure 6-3).

4. The panel is attached to the bottom of the enclosure frame by two snap fasteners. Pull the bottom of the panel out until the panel detaches from the bottom of the enclosure.

5. Lift the panel slightly to release it from the lip at the top of the frame and remove the panel (figure 6-4).

Figure 6-3 Unhooking the Left Side Panel

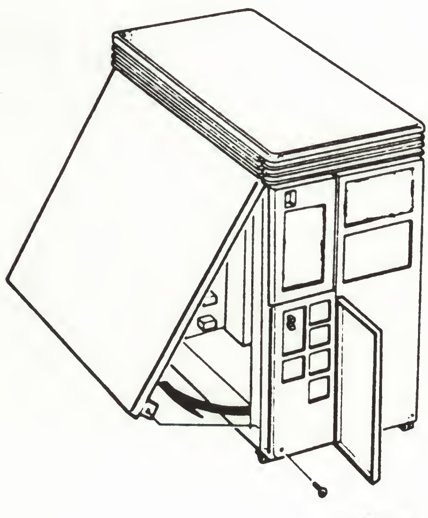
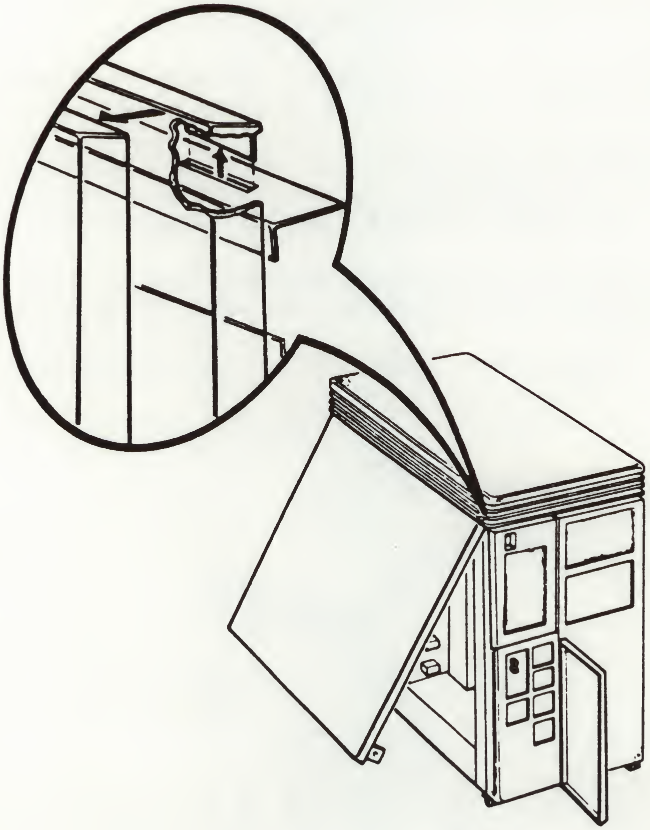


Figure 6-4 Removing the Left Side Panel



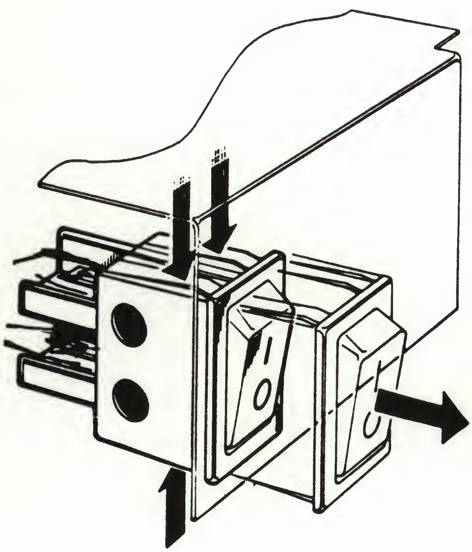
6.3 ON/OFF Switch Removal

1. Remove the left side panel as described in section 6.2.2.

2. Unplug the ON/OFF switch cable from the power supply.

3. Press the top and bottom of the ON/OFF switch and push the switch and its cable out from the inside of the front panel (figure 6-5).

Figure 6-5 ON/OFF Switch Removal



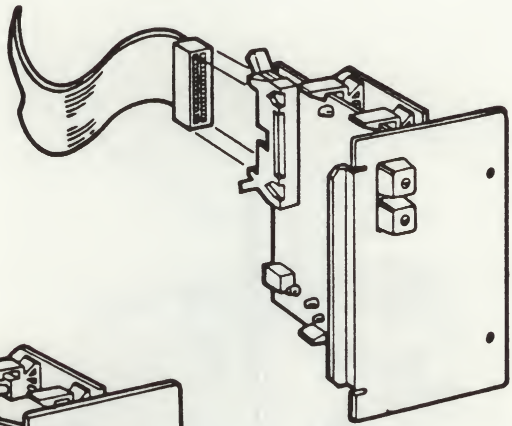
6.4 CPU Console Board Removal

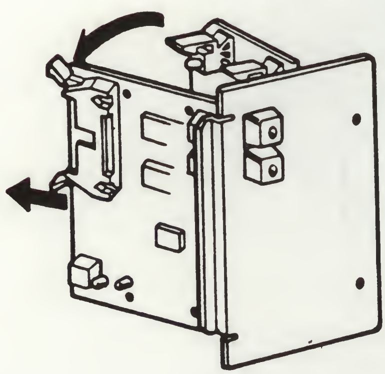
1. Remove the two screws that hold the CPU console board assembly to the control panel.

2. Disconnect the ribbon cable from the CPU console board (figure 6-6).

3. Remove the board from the plastic brackets.

Figure 6-6 CPU Console Board Removal





6.5 5 1/4" (13.3 cm) Mass-Storage Device Removal

The following procedure applies to both removable and fixed media drives.

1. Remove both side panels as described in sections 6.2.1 and 6.2.2.

2. The front panel is attached to the enclosure by four snap fasteners. Remove the front panel by pulling it from the frame until the snap fasteners detach.

3. Disconnect all signal cables and DC power cables from the device.

4. Push down on the release tab found below the front of the device and slide the device out of the shelf.

6.5.1 RD52 MAIN PRINTED CIRCUIT BOARD REMOVAL

> NOTE
> Replace the main printed circuit board (MPCB) only on RD52 disk drives with a part number of 30-21721-02.

> NOTE
> Screws located on the slide plate and MPCB are different sizes. Make sure you reinstall the screws in their proper location.

1. Remove the four phillips screws retaining the slide plate and ground clip. Set the slide plate aside (Figure 6-7).

2. Unplug the 2-pin connector (Figure 6-8).

3. Remove the two Phillips screws that attach the front bezel to the drive.

Figure 6-7 Remove the Slide Plate

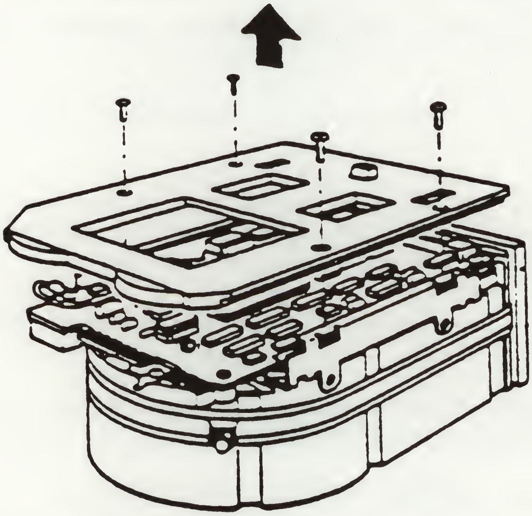
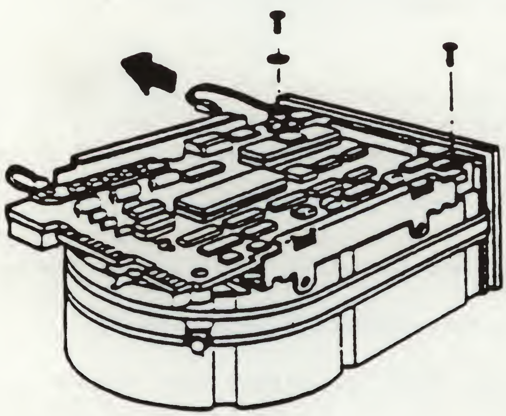


Figure 6-8 Remove the 2-pin Connector and Screws



4. Remove the front bezel by pulling it away from the drive. The bezel is held in place with pop fasteners (Figure 6-9).

5. Remove the three Phillips screws from the heatsink, grounding strip, and the corner opposite the heatsink (Figure 6-10).

6. Lift the MPCB straight up until it clears the chassis. This disconnects P4, a 12 pin fixed plug (Figure 6-11).

7. Disconnect P5, a 10-pin connector.

Figure 6-9 Remove the Front Bezel

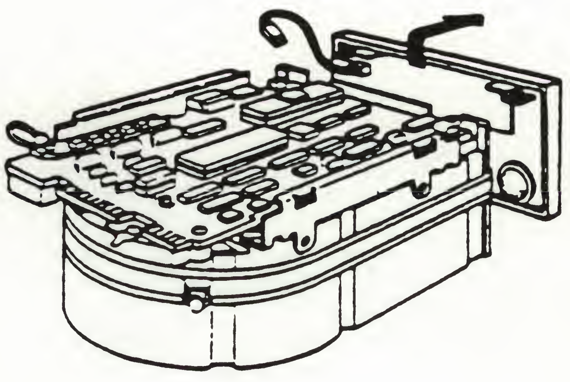


Figure 6-10 Remove Phillips Screws from Heatsink

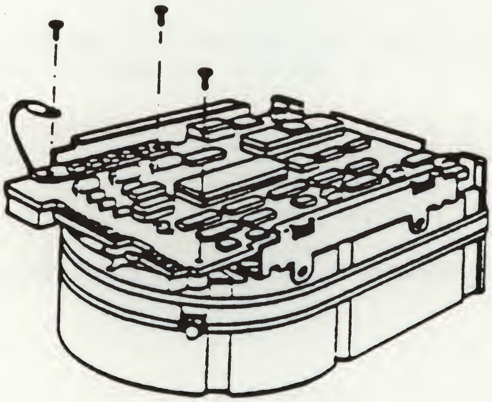
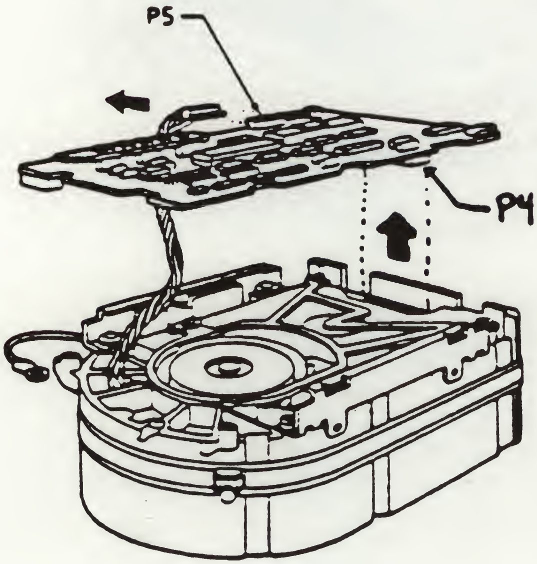


Figure 6-11 Remove the MPCB



6.5.2 RD53 DISK DRIVE DEVICE ELECTRONICS BOARD REMOVAL

The RD53 read write board is the only part of an RD53 drive that is replaceable. Always try replacing the device electronics board before you replace an entire RD53 drive.

1. Remove the four phillips screws retaining the slide plate and ground clip. Set the plate aside (figure 6-12).

2. Loosen the two captive screws which hold the device electronics board in place.

3. Rotate the board upward (the board pivots in hinge slots at the front of the drive). Being careful not to strain any of the connectors or cables, tilt the board over center until it comes to rest against the outer frame.

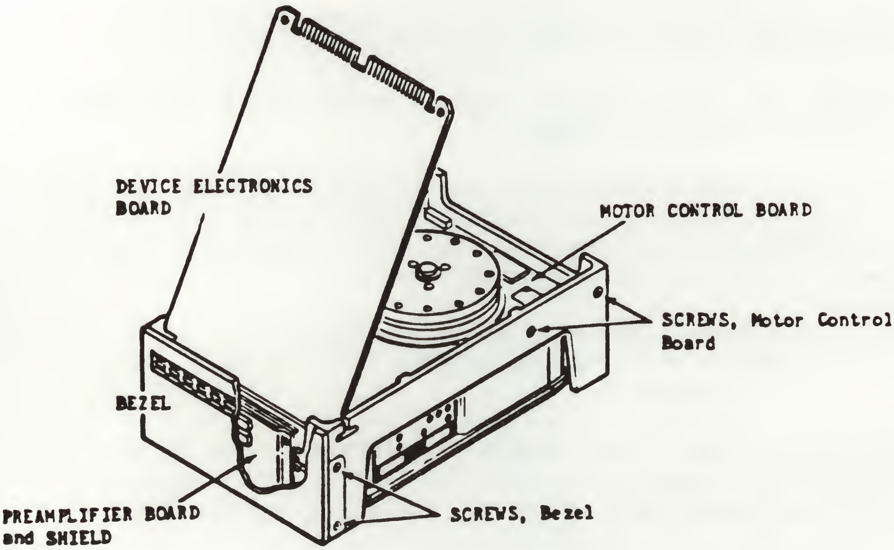
   CAUTION: Flexible circuit material is fragile and requires careful handling to avoid damage.

4. Disconnect the Motor Control board connector J8 and the Preamplifier board connector J9 from the read/write board. Both connectors and cables are fragile, handle them with care.

5. Lift the board out of the hinge slots.

   NOTE: Make sure to set the jumpers and switches for the new board to the same positions as the old one.

Figure 6-12 RD53 Device Electronics Board Removal



6.6 Fan Removal

The following two sections list the procedures for removing the card-cage fan and the mass-storage fan. The fan in the power supply is not an FRU.

6.6.1 Mass-Storage Fan Removal

1. Remove the left side panel as described in section 6.2.2.

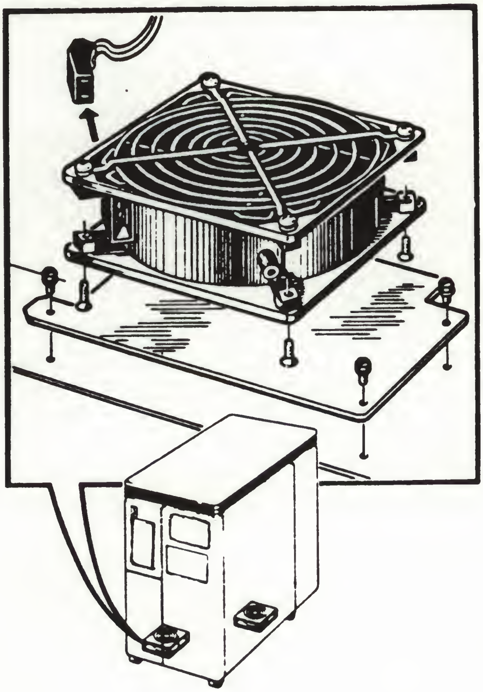
2. Note that the DC power cable's plug is coutoured to fit along the side of the fan. Disconnect the cable from the fan. When replacing the fan be sure to align the cable the same way.

3. Remove the three screws that connect the fan's metal base plate to the enclosure frame (figure 6-13).

NOTE
Observe the alignment of the fan before removing it. Be sure to align the replacement fan in the same direction.

4. Remove the four screws that connect the fan to the metal base plate.

Figure 6-13 Mass-Storage Fan Removal



6.6.2 Card-Cage Fan Removal

1. Remove the right side panel as described in section 6.2.1.

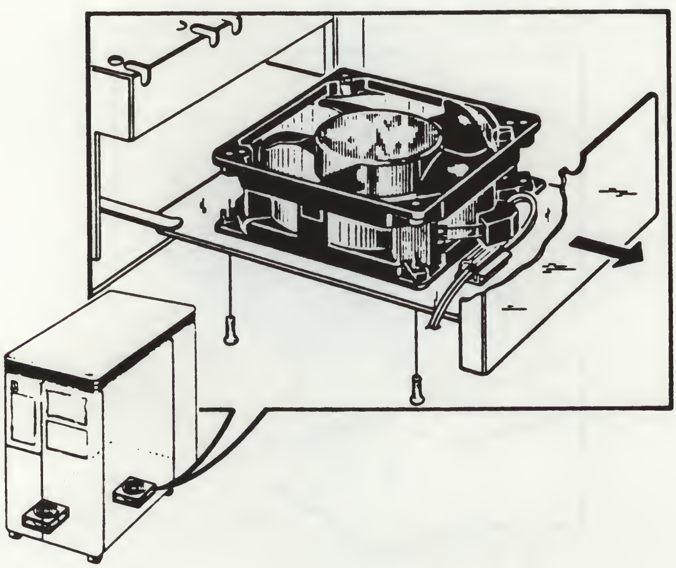
2. Remove the card-cage door by releasing the two clasps at the front end of the door and swinging the door open.

3. Slide the tray below the card-cage partially out (figure 6-14).

4. Note that the cable's DC power plug is contoured to fit along the side of the fan. Disconnect the cable from the fan. When replacing the fan be sure to align the cable the same way.

5. Remove the four screws that connect the fan to the tray.

Figure 6-14 Card-Cage Fan Removal



6.7 Module Removal

1. Remove the right side panel as described in section 6.2.1.

2. Remove the card-cage door by releasing the two clasps at the front end of the door and swinging the door open.

3. Slide the module partially out of the backplane (figure 6-15).

4. Note the alignment of any cables attached to the module. Disconnect the cables.

5. Remove the module from the enclosure.

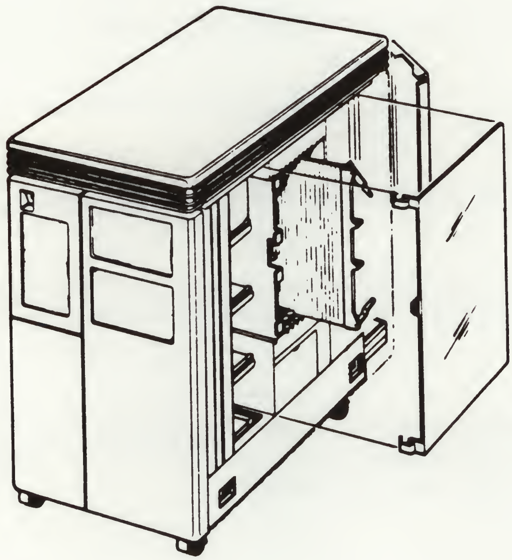
NOTE

Be sure that the jumper and switch configurations on the replacement module are the same as those on the module removed.

NOTE

Before removing a module from the backplane, be sure to note the position of all modules and the alignment of any cables that you disconnect.

Figure 6-15 Module Removal



NOTE: When removing modules from the card cage, carefully but firmly pull the levers which hold the module in place. When installing modules, make sure the levers latch properly as you are trying to seat the module in the backplane.

CAUTION: Static electricity can damage modules. Always use a grounded wrist strap and grounded work surface when working with or around modules.

CAUTION: Remove and install modules carefully to prevent damage to module components and other modules, or possibly changing the switch settings.

NOTE: Replacement modules come wrapped in special antistatic packaging material. A silica gel packet is also included to prevent damage from moisture. Use this antistatic packaging material and silica gel packet to protect any modules you store, transport, or return.

NOTE: If you install a dual-height module in slots 1-4 of the backplane, you must install it in the AB rows. MS630-AA memory modules must be installed in the CD rows of slot 2 or 3. If you install dual-height modules in slots 4 through 12 of the backplane, you must install a grant continuity card (M9407) or a second dual-height module in the other two rows of the slot.

6.8 Door Interlock Switch Removal

1. Remove the right side panel as described in section 6.2.1.

2. Remove the card-cage door by releasing the two clasps at the front end of the door and swinging the door open.

3. There is a cable connecting the interlock switch to the temperature sensor. Disconnect the cable from the temperature tensor (figure 6-16).

4. Remove the two screws that connect the switch to the side of the card-cage and remove the switch.

6.9 Temperature Sensor Removal

1. Remove the right side panel as described in section 6.2.1.

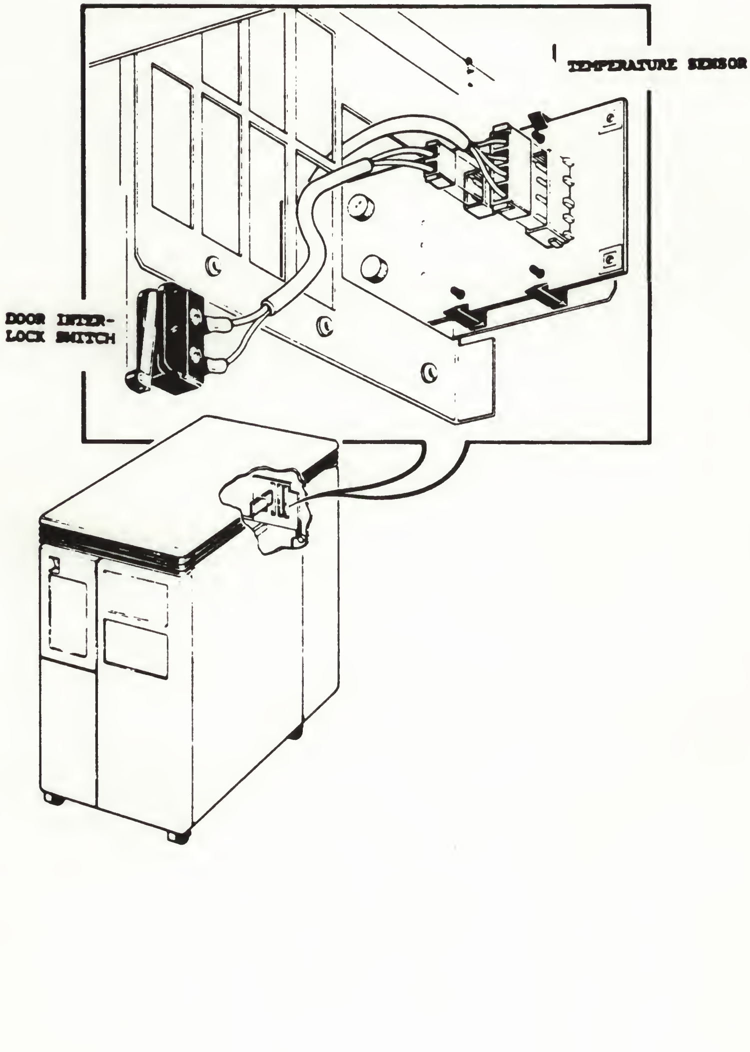
2. Remove the card-cage door by releasing the two clasps at the front end of the door and swinging the door open.

3. There is a cable connecting the interlock switch to the temperature sensor. Disconnect the cable from the temperature sensor (figure 6-16).

4. There is a cable connecting the temperature sensor to the power supply. Disconnect the cable from the temperature sensor.

5. Remove the temperature sensor from the four plastic brackets connecting it to the enclosure frame.

Figure 6-16 Temperature Sensor / Door Interlock Switch



6.10 Power Supply Removal

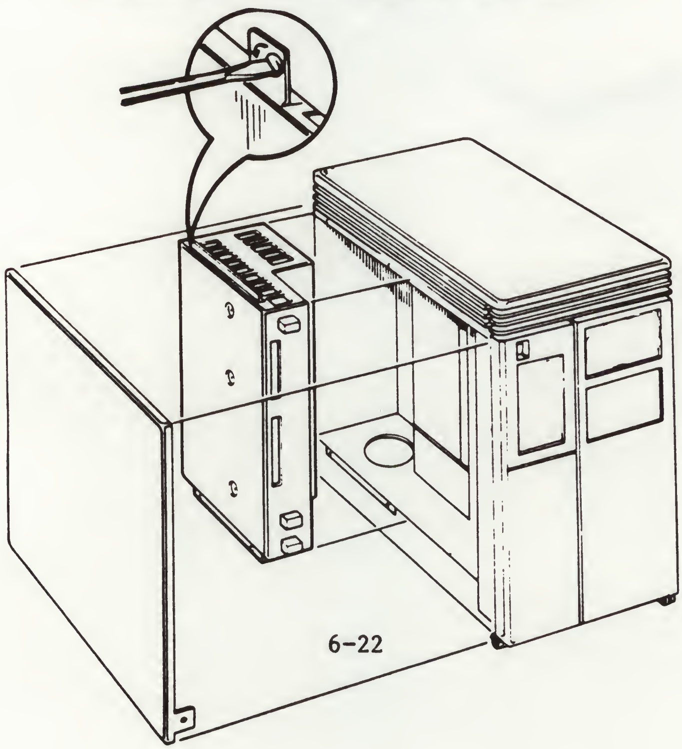
1. Remove the left side panel as described in section 6.2.2.

2. Note the location and alignment of all cables attached to the power supply. Disconnect all cables, including the AC power cord at the rear of the system.

3. Remove the four 1/4 turn fasteners holding the power supply to the enclosure frame and remove the power supply (figure 6-17).

CAUTION
Before installing a new power supply, verify that the voltage select switch at the rear of the power supply is set for the correct AC voltage. Damage to the system could result if the switch is not properly set.

Figure 6-17 Power Supply Removal



6.11 Backplane Removal

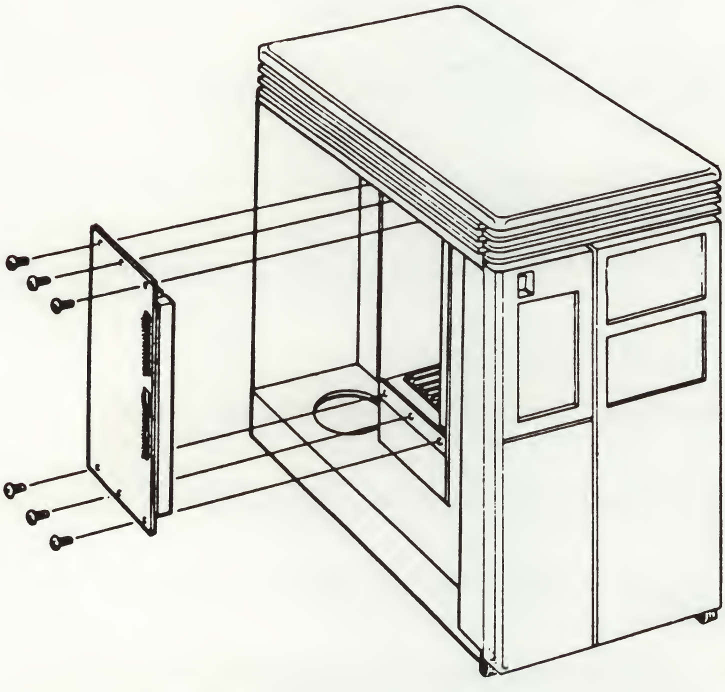
1. Remove both side panels as described in section 6.2.1 and 6.2.2.
2. Slide all modules partially out of the backplane, including the signal distribution board.
3. Remove the power supply as described in section 6.10.
4. There is a metal plate between the backplane and the power supply. Remove the six screws that hold the plate to the enclosure frame.
5. Lift the metal plate and the backplane out of the back of the card-cage (figure 6-18).
6. Remove the screws that hold the metal plate to the backplane.

The backplane is replaced as follows:

1. Insert the screws that hold the metal plate to the backplane.
2. Place the backplane and the metal plate at the back of the card-cage.
3. Insert a module in the first and the last card guide of the card-cage.
4. Align the backplane so that the two modules can be fully inserted into the backplane. Insert the modules.
5. Insert the six screws that hold the metal plate to the enclosure frame.
6. Check the alignment of the backplane by inserting all of the system modules in their original slots.

7. Replace the power supply by reversing the procedure described in section 6.10.

Figure 6-18 Backplane Removal



6.12 Filter Connector Removal

1. Turn the system OFF and unplug the AC power cord from the wall socket.

2. Open the rear door.

3. Disconnect any cables attached to the filter connector. Note where the cables were attached.

4. Remove the right side panel as described in section 6.2.1.

5. Remove the card-cage door by releasing the two clasps at the front end of the door and swinging the door open.

NOTE

Some of the internal cables that connect to the back of filter connectors may not be keyed. Observe the alignment of the internal cables and be sure to re-connect them the same way.

6. Disconnect any cables that connect the filter connector insert to modules inside the enclosure.

7. Remove the screws that hold the filter connector to the rear I/O panel.

8. Remove the filter connector.

APPENDIX A

CONSOLE COMMANDS

A.1 CONSOLE COMMAND SYNTAX

The console accepts commands up to 80 characters long. Longer commands are responded to with an error message. The count does not include rubouts, rubbed out characters, or the terminating carriage return.

Commands may be abbreviated. Abbreviations are formed by dropping characters from the end of a keyword. All commands are recognized from their first character.

Multiple adjacent spaces and tabs are treated as a single space by the console. Leading and trailing spaces and tabs are ignored.

Command qualifiers can appear after the command keyword, or after any symbol or number in the command.

All numbers (addresses, data, counts) are in hexadecimal. (Note, though, that symbolic register names include decimal digits.) Hex digits are 0 through 9, and A through F. The console does not distinguish between upper and lower case either in hex numbers (A through F) or in commands. Both are accepted.

A.2 REFERENCES TO PROCESSOR REGISTERS AND MEMORY

The KA630 console is implemented by macrocode executing from ROM. For this reason, the actual processor registers may not be modified by the command interpreter. When console I/O mode is entered, the console saves the processor registers in a scratch page and all command references to them are directed to the corresponding scratch page locations, not to the registers themselves. When the console reenters program mode, the saved registers are restored and any changes become operative only then. References to processor memory are handled normally except where noted below.

Normally, a free page on the interrupt stack is used for the scratch page so the console does not modify the machine state. If a free page on the interrupt stack cannot be located, the console program uses the last valid page in contiguous physical memory and the original machine state is lost. This should normally occur only on power up.

References to the console scratch page by EXAMINE and DEPOSIT commands must be qualified by the "/U" qualifier. (Access is primarily to simplify debugging of the console program.) The binary load and unload command may not reference the console scratch page.

A.3 CONSOLE COMMANDS

A.3.1 BINARY LOAD AND UNLOAD

X <address> <count> <CR> <checksum>

The X command is for use by automatic systems communicating with the console. It is not intended for use by operators. The console loads or unloads (that is, writes to memory, or reads from memory) the specified number of data bytes, starting at the specified address.

If bit 31 of the count is clear, data is to be received by the console, and deposited into memory. If bit 31 of the count is set, data is to be read from memory and sent by the console. The remaining bits in the count are a positive number indicating the number of bytes to load or unload.

The console accepts the command upon receiving the carriage return. The next byte the console receives is the command checksum, which is not echoed. The command checksum is verified by adding all command characters, including the checksum, (but not including the terminating carriage return or rubouts or characters deleted by rubout), into an 8 bit register initially set to zero. If no errors occur, the result is zero. If the command checksum is correct, the console responds with the input prompt and either sends data to the requester or prepares to receive data. If the command checksum is in error, the console responds with an error message. The intent is to prevent

inadvertent operator entry into a mode where the console is accepting characters from the keyboard as data, with no escape sequence possible.

If the command is a load (bit 31 of the count is clear), the console responds with the input prompt, then accepts the specified number of bytes of data for depositing to memory, and an additional byte of received data checksum. The data is verified by adding all data characters and the checksum character into an 8 bit register initially set to zero. If the final contents of the register is non-zero, the data or checksum are in error, and the console responds with an error message.

If the command is a binary unload (bit 31 of the count is set), the console responds with the input prompt, followed by the specified number of bytes of binary data. As each byte is sent it is added to a checksum register initially set to zero. At the end of the transmission, the 2's complement of the low byte of the register is sent.

If the data checksum is incorrect on a load, or if memory errors or line errors occur during the transmission of data, the entire transmission is completed, and then the console issues an error message. If an error occurs during loading, the contents of the memory being loaded are UNPREDICTABLE.

Echo is suppressed during the receiving of the data string and checksums.

It is possible to control the console through the use of the console control characters (control-C, control-S, control-O, etc.) during a binary unload. It is not possible during a binary load, as all received characters are valid binary data.

Data being loaded with a binary load command must be received by the console at a rate of at least one byte per second. The command checksum that precedes the data must be received by the console within 10 seconds of the <CR> that terminates the command line. The data checksum must be received within 10 seconds of the last data byte. If any of these timing requirements are not met the console aborts the transmission by issuing an error message and prompting for input.

The entire command, including the checksum, may be sent to the console as a single burst of characters at the console's specified character rate. The console is able to receive at least 4K bytes of data in a single 'X' command.

A.3.2 BOOT

BOOT [<qualifier list>] [<device>]

The device specification is of the format 'ddcu', where 'dd' is a two letter device mnemonic, 'c' is an optional one digit controller number, and 'u' is a one digit unit number.

The console initializes the processor and starts VMB running. (See the section on System Bootstrapping.) VMB boots the operating system from the specified device. The default bootstrap device is determined as described in the section on system bootstrapping.

Qualifier:

- /R5:<data> - After initializing the processor and before starting VMB, R5 is loaded with the specified data. This allows a console user to pass a parameter to VMB. (To remain compatible with previous processors, /<data> will also be recognized to have the same result.)

A.3.3 COMMENT

! <comment>

The comment command is ignored. It is used to annotate console I/O command sequences.

A.3.4 CONTINUE

CONTINUE

The processor begins instruction execution at the address currently contained in the program counter. Processor initialization is not performed. The console enters program I/O mode.

A.3.5 DEPOSIT

DEPOSIT [<qualifier list>] <address> <data>

Deposits the data into the address specified. If no address space or data size qualifiers are specified, the defaults are the last address space and data size used in a DEPOSIT or EXAMINE command. After processor initialization, the default address space is physical memory, the default data size is long, and the default address is zero.

If the specified data is too large to fit in the data size to be deposited, the console ignores the command and issues an error response. If the specified data is smaller than the data size to be deposited, it is extended on the left with zeros.

The address may also be one of the following symbolic addresses:

- PSL - the processor status longword. No address space qualifier is legal. When PSL is examined, the address space is identified as "M" (machine dependent).
- PC - the program counter (general register 15). The address space is set to /G.
- SP - the stack pointer (general register 14). The address space is /G.

- o Rn - general register 'n'. The register number is in decimal. The address space is /G. For example:
  D R5 1234 is equivalent to D/G 5 1234

  D R10 6FF00 is equivalent to D/G A 6FF00

- o '+' - the location immediately following the last location referenced in an examine or deposit. For references to physical or virtual memory spaces, the location referenced is the last address, plus the size of the last reference (1 for byte, 2 for word, 4 for long). For other address spaces, the address is the last address referenced, plus one.

- o '-' - the location immediately preceding the last location referenced in an examine or deposit. For references to physical or virtual memory spaces, the location referenced is the last address minus the size of this reference (1 for byte, 2 for word, 4 for long). For other address spaces, the address is the last addressed referenced minus one.

- o '*' - the location last referenced in an examine or deposit.

- o '@' - the location addressed by the last location referenced in an examine or deposit.

Qualifiers:

- o /B - The data size is byte.

- o /W - The data size is word.

- o /L - The data size is longword.

- /V - The address space is virtual memory. All access and protection checking occur. If the access would not be allowed to a program running with the current PSL, the console issues an error message. Virtual space DEPOSITs cause the PTE<M> bit to be set. If memory mapping is not enabled, virtual addresses are equal to physical addresses.

- /P - The address space is physical memory.

- /I - The address space is internal processor registers. These are the registers addressed by the MTPR and MFPR instructions.

- /G - The address space is the general register set, R0 through PC.

- /U - Access to console program memory is allowed. This qualifier also disables virtual address protection checks.

- /N:<count> - The address is the first of a range. The console deposits to the first address, then to the specified number of succeeding addresses. Even if the address is the symbolic address "-", the succeeding addresses are at larger addresses. The symbolic address specifies only the starting address, not the direction of succession. For repeated references to preceding addresses, use "REPEAT DEPOSIT - <data>".

> NOTE: Only memory may be accessed as bytes or words. Registers, the PSL and the IPRs must be accessed using the longword reference. This means that the /B and /W qualifiers may not be used with the /I and /G qualifiers.

For example:

D/P/B/N:1FF 0 0	Clears the first 512 bytes of physical memory.
D/V/L/N:3 1234 5	Deposits 5 into four longwords starting at virtual address 1234.
D/N:8 R0 FFFFFFFF	Loads general registers R0 through R8 with -1.
D/N:200 - 0	Starting at previous address, clear 513 bytes.

If conflicting address space or data sizes are specified, the console ignores the command and issues an error response.

A.3.6 EXAMINE

EXAMINE [<qualifier list>] [<address>]

Examines the contents of the specified address. If no address is specified, "+" is assumed. The address may also be one of the symbolic addresses described under DEPOSIT.

Qualifiers:

The same qualifiers may be used on EXAMINE as may be used on DEPOSIT.

RESPONSE: <tab><address space identifier> <address> <tab> <data>

The address space identifier can be:

- P - physical memory. Note that when virtual memory is examined, the address space and address in the response are the translated physical address.
- G - general register.

- o I - internal processor register.
- o M - machine dependent (used only for display of the PSL).

A.3.7 FIND

FIND [<qualifier list>]

The console searches main memory starting at address zero for a page-aligned 64 kilobyte segment of good memory, or a restart parameter block (RPB). If the segment or block is found, its address plus 512 is left in SP. If the segment or block is not found, an error message is issued, and the contents of SP are UNPREDICTABLE. If no qualifier is specified, /RPB is assumed.

Qualifiers:

1. /MEMORY - search memory for a page aligned segment of good memory, 64 kilobytes in length. The search includes a read/write test of memory and leaves the contents of memory UNPREDICTABLE.

2. /RPB - search memory for a restart parameter block. The search leaves the contents of memory unchanged.

A.3.8 INITIALIZE

INITIALIZE

A processor initialization is performed. The following registers are set (all values are hexadecimal):

PSL	041F0000
IPL	1F
ASTLVL	4
SISR	0
ICCS	0
RXCS	0
TXCS	80
MAPEN	0

All other registers are UNPREDICTABLE.

The previous console reference defaults (the defaults used to fill in unsupplied qualifiers for DEPOSIT and EXAMINE commands) are set to physical address, longword size and address 0.

A.3.9 HALT

HALT

The HALT command has no effect, the processor is already halted when in console I/O mode.

A.3.10 REPEAT

REPEAT <command>

The console repeatedly displays and executes the specified command. The repeating is stopped by the operator typing control-C. Any valid console command may be specified for the command with the exception of the REPEAT command.

A.3.11 START

START [<address>]

The console starts instruction execution at the specified address. If no address is given, the current PC is used. If no qualifier is present, macroinstruction execution is started. If memory mapping is enabled, macroinstructions are executed from virtual memory. The START command is equivalent to a DEPOSIT to PC, followed by a CONTINUE. No INITIALIZE is performed.

A.3.12 TEST

TEST [<test number>]

The console invokes a diagnostic test program denoted by <test number>. Valid test numbers are 3 through 7 and "B". If no test number is supplied, no test is performed.

A.3.13 UNJAM

An I/O bus reset is performed.

APPENDIX B--CONSOLE ERROR MESSAGES AND EXPLANATIONS

HEX VALUE	MESSAGE	EXPLANATION
02	EXT HLT	Break was typed on the console, QBINIT or QHALT was asserted.
04	ISP ERR	In attempting to push state onto the interrupt stack during an interrupt or exception, the processor discovered that the interrupt stack was mapped NO ACCESS or NOT VALID.
05	DBL ERR	The processor attempted to report a machine check to the operating system, and a second machine check occurred.
06	HLT INST	The processor executed a HALT instruction in kernel mode.
07	SCB ERR3	The vector had bits <1:0> equal to 3.
08	SCB ERR2	The vector had bits <1:0> equal to 2.
0A	CHM FR ISTK	A change mode instruction was executed when PSL<IS> was set.
0B	CHM TO ISTK	The exception vector for a change mode had bit <0> set.
0C	SCB RD ERR	A hard memory error occurred while the processor was trying to read an exception or interrupt vector.
10	MCHK AV	An access violation or an invalid translation occurred during machine check exception processing.

11	KSP AV	An access violation or an invalid translation occurred during processing of an invalid kernel stack pointer exception.
15	CORRPTN	The console database was corrupted. The console program simulates a power-up sequence and rebuilds its database.
16	ILL REF	The requested reference would violate virtual memory protection, the address is not mapped, the reference is invalid in the specified address space, or the value is invalid in the specified destination.
17	ILL CMD	The command string can not be parsed.
18	INV DGT	A number has an invalid digit.
19	LTL	The command was too large for the console to buffer. The message is issued only after receipt of the terminating carriage return.
1A	ILL ADR	The address specified falls outside the limits of the address space.
1B	VAL TOO LRG	The value specified does not fit in the destination.
1C	SW CONF	For example, two different data sizes are specified with an EXAMINE command.
1D	UNK SW	The switch is unrecognized.
1E	UNK SYM	The symbolic address in an EXAMINE or DEPOSIT is unrecognized.

1F	CHKSM	The command or data checksum of an X command is incorrect. If the data checksum is incorrect, this message is issued, and is not abbreviated to "Illegal command."
20	HLTED	The operator entered a HALT command.
21	FND ERR	A FIND command failed either to find the RPB or 64 kb of good memory.
22	TMOUT	During an X command, data failed to arrive in the time expected.
23	MEM ERR	Parity error detected.
24	UNXINT	An unexpected interrupt or exception has occurred.
40	NOSUCHDEV	No bootable devices found.
41	DEVASSIGN	Device is not present.
42	NOSHUCHFILE	Program image not found.
43	FILESTRUCT	Invalid boot device file structure.
44	BADCHKSUM	Bad checksum on header file.
45	BADFILEHDR	Bad file header.
46	BADIRECTORY	Bad directory file.
47	FILNOTCNTG	Invalid program image file.
48	ENDOFFILE	Premature end of file encountered.
49	BADFILENAME	Bad file name given.
4A	BUFFEROVF	Program image does not fit in available memory.

4B	CTRLERR	Boot device I/O error.
4C	DEVINACT	Failed to initialize boot device.
4D	DEVOFFLINE	Device is off line.
4E	MEMERR	Memory initialization error.
4F	SCBINT	Unexpected SCB exception or machine check.
50	SCBZNDINT	Unexpected exception after starting program image.
51	NOROM	No valid ROM image found.
52	NOSUCHNODE	No response from load server.
53	INSFMAPREG	Invalid memory configuration.
54	RETRY	No devices bootable, retrying.

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